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USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

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Cybernetics, Computers and Automation Technology

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THE TIME OF THE INFORMATION TECHNOLOGIES

Moscow ZNANIYE-SILA in Russian No 3, Mar 86 pp 4-5

[Article by Academician A. Yershov under the rubric "Put to Life Decisions of 27th CPSU Congress": "The Time of the Information Technologies"]

Among numerous events that happened in the world of computer technology in recent years the most important is the advent and wide application of microprocessors, because only these devices can make the effect of computerization in all areas of social life really comprehensive and fundamental.

What is a microprocessor? It is a board containing a computing device with a memory, a control unit and interface circuits connecting it with other devices and communication lines. In some cases the entire microprocessor is contained within a single IC, i.e. within a single silicon chip. In other words, a microprocessor is a "stripped" computer, without input and output devices, the power supply and other peripheral devices, which is housed in a volume ranging from a single board to a single IC. The size of a single chip microprocessor is just about two square centimeters, whereas a single board microprocessor is a plate of about 20 x 20 cm.

Microprocessors are used in two ways. One is a built-in microprocessor, when an IC or a board containing the microprocessor is inserted in some device. It takes signals generated by the device and organizes its automatic operation. Microprocessors are built into photographic cameras, making it possible to automatically set the exposure and the aperture, and into thousands and tens of thousands of other devices and machines; the number of their applications is enormous, and their name is Legion.

Another, and equally important application of microprocessors is building on their base microcomputers, i.e. small computers that, because of their small size and low cost, can become articles for personal use, the very same PCs, or personal computers, that are so much talked about now by all newspapers, magazines, radio and TV stations. However, the most fundamental and mass application of microprocessor-based computers is production of machines with built-in microprocessors and controllers. But in this case even the choice of words itself reflects a superficial, secondary application of computing devices: we still view a machine that we design in a habitual way that has been taking shape over decades, and only later we start thinking of ways to build a microprocessor into it. In other words, we still view the brain of a machine as a foreign element, that has to be added to the machine after the

latter has been completely designed and built. The general view and the layout, as well as weight, strength and energy parameters are still the primary means for the integral design of a machine. Then comes the turn of kinematic diagrams, energy supply subsystems, subsystems for supply of processed or consumed materials etc.

All that is clearly not enough nowadays. The information model of a machine should be as important as the above mentioned avowed landmarks in the machine development.

This model deals with the same parts of the machine as before, but each device is now being viewed first of all as a source of information signals and as an object for applying controlling influences. The information model determines the interdependency of all information flows and expresses it in the language of mathematical functions or algorithms, and, which is the most important, uses the same arrangement to include a human operator into general interaction, transfering, as much as possible, the processing of information to a computer.

The problem is to make the information model as early and as integral a component of the design of any device, as a braih embryo that takes shape and gets stronger as the fetus of a live organism grows. This integral information model must become as deeply engrained a component of a specialists's scientific and engineering thinking, as the strength of materials, theoretical mechanics and electronic circuit engineering used to be. In our country too, e.g. in Leningrad, curriculae have been designed that make it possible to give give university graduates fundamental training that would enable them to master methods for design of information models of new machines and devices, i.e. the technology that will bring our country into the 21st century.

The information model concept is one of the central concepts of computerized information processing- a field of science that has taken shape, both ideologically and organizationally, in the very recent years. Models of the world, that are,in essence, of informational nature, have been used for a long time in physics, chemistry and mechanics. This is because these sciences, as they study fundamental principles of matter, pay ever growing attention to the structure of various quantities and bodies, substances and fields, as well as to their interactions, i.e. to the transmission of various signals carrying information that is important for a given process. In biology too, the informational treatment of basic phenomena related to life and especially to higher nervous activity has been ever wider used recently.

This is no accident at all. The humankind entered a stage in its development when it has realized and to a large extent comprehended first the structure of matter, then that of energy and the relationship between the two, which brought it closer to the creation of a picture of the indivisible material nature of the world.

But the humankind has not stopped on its way to cognition. The current period in the penetration by human civilization into the secrets of universe is not anymore related to mastering matter or energy, but to mastering information.

Any knowledge that has been gained becomes available, mobile, active and productive. People begin using this knowledge to create new types of machines- robots and automatic devices.

Computers entered our lives almost 30 years ago. But has finally a qualitative change in computer development taken place or is it simply that we just now realized the real role of computers in human life?

The correct answer is both, but there is also the third, more important answer: as I have already stated, we have entered a new period in the development of human civilization. We are witnessing the advent of the time when any knowledge accumulated by humankind becomes easily available to all of us on Earth. Because of this, a man for the first time begins to fully understand himself, and this understanding takes a material shape: intelligent robots are created, as well as automated manufacturing facilities that possess human action and thinking capabilities. And all this is based on a computer and on our ability to establish fruitful contact with it.

However, a peculiarity of the current stage of automation is that a worker will not at all be just a robot's master that issues appropriate orders. He will have to do a lot himself: properly orient workpieces for the robot, protect it from dirt and moisture, wipe the dust off its photocells and perform a lot of other ancillary duties, servicing his intellectual and production helper. And the robot will not give the worker an easy time, nor can the worker expect a thank you from the robot.

As is well known, at all times relations between people and machines were not simple ones. Nobody knows for sure what the first machine looked like nor when it was made. Most probably, it happened many thousands years ago in the Ancient Orient. Probably the contenders are a water-wheel and a hurling device: creative and destructive forces of nature simultaneously entered the competition for the possession of the human mind. It was when the first machine had been created that the undivided rule of Nature on Earth ended, and a new force emerged- the Humankind.

Let the reader not be embarrassed by the seeming pomposity and contradictory character of these metaphors. So far nobody can stay indifferent watching a machine operation; this spicy blend of admiration and fear that we remember from our childhood, stays with us for the rest of our lives. Creation of a machine and its alienation in the form of a social product of creative forces of its creator is a powerful source of emotions that can only be compared to parental feelings.

A man and a machine... In different ages the humankind has been comprehending this contraposition and combination in different ways. Our generation, whose lot has been inventing and mastering computers, is no exception. The fact that computers sometimes exhibit clear signs of judicious behavior gives this old antithesis an unprecedented poignancy and meaning.

My life was such that I have been dealing with computers since 1952. I was growing up with computers around, same way as, in the past, rural kids were

growing up with horses and other domestic animals around. Maybe that is why it is easier for me than for many others to enter the new computer world and see its regularities. In any case, I can clearly see a special feature of the current moment: it looks as if various technical innovations and theoretical developments in computer science and engineering have purposely ripened at the same time and make it possible to make a gigantic leap. To prove my point, I can cite numerous examples. But I will only dwell on several cases that are in direct relation to one of the projects being developed in the Experimental Computerized Information Processing Laboratory, Computer Center, Siberian Department, USSR Academy of Sciences; I am the head of the Laboratory. It has to do with the development of MRAMOR. To make it clear what type of a system MRAMOR is, I would like to refer to the text that was handed to specialists who attended a demonstration that took place in the "Pravda" publishing house in Moscow in the summer of 1985:

"Dear comrade:

You are taking part in the first demonstration of a prototype of a multifunctional automated service workstation for editorial staff-MRAMOR [Russian acronym for the above]. Based on MRAMOR, various new workstations are being created for the automation of input, editing and preparing for print of various publications, such as newspapers, books and magazines, with subsequent non-typesetting production of printing forms.

Keyboard or teletype text input into the system's memory makes it possible to automate the entire processing of the text for the newspaper release while saving the type-setting on a disk. With the help of MRAMOR, the editorial staff read the text in a "window" on a scren and make necessary corrections, can change the setting format and pitch type, determine how many lines on a page the text will take and print the text for reading and proof-reading in accordance with standard editorial procedures.

One can lay out a page on a screen, determine whether it is necessary to cut the material and adjust its volume in accordance with the available page space. And yet one can at any time call any text onto the screen, correct or cut the text etc. Laid out pages remain in MRAMOR's memory and can be transmitted into a device for making originals in printing forms without typesetting".

Professionals that were present at the demonstration of MRAMOR highly complemented us on the job done, because the automated workstation for an editorial staff member is not only convenient and inexpensive (its price is between 20 and 40 thousand rubles), but it also completely revolutionizes the operation of publishing houses, newspapers and magazines. Cumbersome and awkward archives are not needed anymore, as all the facts, figures, author's cards and readers' letters, let alone necessary addresses and phone numbers, are stored in the computer memory and can be retrieved in the twinkling of an eye. Text editing is mush simpler too: one just cuts out the unnecessary piece or adds a new one on the screen, and the entire text wraps up in a matter of seconds, so there are no voids. Another split second- and the text is being "typeset" on the same display, using any type, any pitch, any format

etc. And then the formed page of a newspaper, a book or a magazine is immediately printed-as many copies as needed- or transfered to printing forms for printing later.

And now I would like to mention the technical innovations that arrived just recently and made it possible to develop our system, as well as tens of thousands of similar systems that are being developed in various branches of our national economy. The innovations I am referring to are floppy disks, Winchester disks and an ultra-high speed reproduction device- a laser printer.

A floppy disk, or diskette, is a flexible disk with a magnetic coating. The information is recorded on a diskette the same way it used to be recorded on old huge magnetic disks that were mounted stationary: on one or on both sides of the disk magnetic heads are installed, that can precisely move along the diskette radius in given increments, which makes it possible to position them at any track. Information is read from the diskette in the same way, with the appropriate synchronization. The main remarkable feature of a floppy disk is that it is not permanently installed on a machine, as was the case before, but rather inserted into the machine like a cassette into a "Fotokor" camera that people of my generation remember. It is a small, post card size and thickness disk, and it is very light, which makes its storage and transportation easy. Machine media became truly portable, they are produced by the hundreds of millions and becoming as widespread as records, cassettes or videotapes.

A hard disk, or Winchester disk, is simply a beautifully made miniature disk that in all other respects is similar to a regular disk that has been serving as machine memory for many years. Due to the high precision of mechanical components, the same amount of information can be stored on a hard disk that has the diameter of a regular record, as could be stored before on a machine disk the size of a washer. First it was assumed that this marvelously engineered device was developed in order to make a cat laugh. Who needs this "record chasing"? Why fight tremendous difficulties and solve puzzling engineering problems only to make a disk that is only four times smaller than a standard one? Even the most authoritative magazine "Datamation" shamefully admitted later that there was a time when it was taking part in ridiculing the hard disk. But as soon as a microprocessor had been developed, it became clear what the compact hard disk was needed for: combined, a microprocessor and a hard disk made a professional personal computer, that has now become the heart and the brain of modern systems for automation of any kind of work, including intellectual work, like, for instance, our MRAMOR.

Another most recent technical innovation, a laser printer, owes its birth to the wide spreading of lasers and a newly acquired capability to change a laser beam position with high precision and to turn a laser on and off in infinitesimal time spans. A machine controls a laser beam, directing it along a paper page, a printing machine drum or a film. As in a TV raster scanning, the beam scans the entire surface: it is off where a white spot is supposed to be, and on in all spots along the contour of letters, digits and various signs and images. This way, in a fraction of a second an electronically "typeset" copy of a book or magazine is created, or a printing form that can be used to print the necessary number of copies on a rotary printing press, or else a

film suitable for making a printing form.

The electronic typesetting, when a computer, using individual graphic elements, is forming in its memory a visual image of every sign and every letter, combined with a laser printer, that can materialize this image on a surface, radically changes the printing trade. So far this trade was conducted in such a way that the exchange of proofs between an author (or a publishing house) and a printing shop was getting ever more complicated. This process has reached its apogee right now, with modern phototypesetting, when, in order to correct a text, one has to "shred" films used for preparing printing forms. The new technology simply eliminates the problem, as all the work on a text is done at the publishing house, and when a point of "no corrections needed anymore" is reached, a computer saves the typesetting of a book containing 10 publisher's sheets on a small diskette fitting into an envelope. In the printing shop this diskette is logged into a device that controls a laser beam (such devices have been designed here, in the Novosibirsk Academia City, in the Institute for Automation and Electrometry) and in a few seconds the printing forms are ready.

We are entering a world of new technologies, when individual achievements in various scientific and technical fields are being integrated, thus resolving the heretofore insoluble contradictions, revolutionizing the manufacturing and decisively changing the world. The above presented example of combining the successes of laser and computer technologies that made it possible to solve a seemingly dead-end printing problem, is but one of many similar ones. The central role in this creative process is played by the complete computerization of the country, which is the call of the time, the result of the action of historically determined natural development of human civilization and a necessary prerequisite for our fast forward movement along the difficult roads of the scientific and technical revolution.

In recent years the interest has heightened in studying the creative legacy of V.I. Vernadskiy, a prominent Russian scientist and naturalist, who worked in the first half of the 20th century. Using his teaching of a "noosphere", a new formation on Earth emerging as a result of human activities, one can call the results of the first, the second and the third stages in the development of our civilization a technosphere, an ergosphere and an infosphere, respectively. Of course, I am not the first one to use these words. But my point is that the future of automation is directly and closely related to the infosphere, which is, naturally, only a part of the noosphere. The infosphere will play the decisive role in the reorganization of the technosphere, will control the ergosphere via the technosphere and will become an active intermediary between people.

There are theories that synchronize the progress of humankind with the stages in the development of communications. The periodization that links the progress with mastering matter, energy and information, also correlates well with this theory. The technosphere gave us roads and transportation. The ergosphere is being realized through electric power plants, power transmission lines and oil and gas pipelines. And the infosphere is being created through means for communication, retrieving and processing of information.

What will be the scope of the infosphere in the coming years? According to my calculations, in such major regions as the USSR, the USA and the Western Europe there must be several billions of built-in microprocessors, hundreds of millions of personal computers and many millions of universal computers. It is these machines and devices that will change our life, making it fuller, wiser, more sensible and, in the end, happier than now.

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ECONOMIC INEFFICIENCY OF MILITARY TRANSPORT OPERATIONS NOTED

Moscow KRASNAYA ZVEZDA in Russian 20 Feb 86 p 2

[Article by Maj Gen L. Rudenko, "Knowing How to Calculate for Thrift and Economy"]

[Text] I recently came to be the witness of how the troops of a ground to air missile unit returning from the firing range celebrated. Many warm words were directed to those who, having demonstrated considerable combat skill, came out the victor in the competition. I experienced mixed feelings upon hearing them. Of course, the successes of the missile troops made me glad though. At the same time, I wanted to ask: was not the success achieved at too great a price? Literally prior to my own departure for the unit, I had to become familiar with documents related to the imposition of a large monetary fine on the victors. . . for idle layovers of railroad cars. When the totals were added up for the competition, these shots were not remembered for some reason. The economic aspect evaded attention.

I will state as the chief of the military communications service of the district that no small amount is being done here in order to make effective use of the rolling stock of rail transport. In the past year, just by decreasing the amount of penalty fines, we succeeded in saving a considerable amount of money. By past measures, one could be included among the leaders. But today, such savings on some fines can no longer help us out. There are considerable other reserves that are as yet being poorly utilized. One of them is a more careful and well thought-out planning of military shipments. The nation's transportation system, as is well known, operates at a strictly regulated, intense pace. In the 12th Five-Year Plan, the railroad workers, for example, are confronted with the task of significantly improving the volume of national load shipments not by a quantitively growth in the rolling stock, but rather by accelerating its turnover, increasing the rate of travel of the trains. In this regard, there is no small amount to be done for the efficient utilization for the rolling stock and the military communications organs.

We have already made certain changes in this regard. Each request for a shipment is carefully analyzed to see that the demand for rolling stock was not overstated. It must be admitted that one still frequently runs into those who like to do everything with a "reserve". Let us say that it is necessary to ship several boxes, and an entire car is requested. And then it

turns out: there is a half-empty car, here there is an underloaded flatcar and it turns out as a result that entire trains haul only air. This is why we are striving to completely eliminate inefficient, excessively short and opposing shipments.

But it is not easy to do this, and there is yet a lot to be done here. When planning shipments today, one must make as extensive as use possible of computers for the preparation of the computational data. This is how they do things, for example, on the Oktyabrskaya railroad, with which we have a clear-cut interrelationship set up.

There are now electronic assistants in many units and in military schools. Finally, there is also a district computer center, equipped with modern hardware. However, it is used for the solution of primal problems at the economic junction points and the savings are as yet quite inadequate. The demand for rolling stock for combat training missions is calculated in the best case by means of a slide rule or adding machine. These tools, which are primitive by present standards, make the work labor intensive, long and preclude the possibility of generating and comparing variants. And this in turn frequently leads to errors.

Why then, having modern computer hardware in the arsenal, do we only rarely turn to it for assistance? The question is a complex one. Here, most probably, the force of habit is being felt - the inertia of the thinking of those rear commanders and specialists for whom the use of modern computers has not yet become a necessity.

Knowing how to use computers is only a constituent part of the battle for savings and thrift. A sense of responsibility on the part of commanders and specialists in the rear, those who plan the organization of shipments as well as clarity and coordination of their actions with the actions of those handling these shipments are also needed for the successful resolution of this problem.

Such an important problem as the on-time shipment of seasonal deliveries of vegetables and potatos has been waiting for its own engineering substantiation. The routes are known and the demand of the units is also known. Nonetheless, we annually incur considerable losses in the procurement of these food products. Thus, this past fall, the officers of the military communications service of the district were literally stumped by a car of onions which wandered around the southern and northern routes for a long time. It turned out that it was intended for a commissary in one of the remote garrisons. But there they did not even suspect that the product had been procured by their own personnel. It was necessary to reassign the car with the onions to another location hundreds of kilometers away. And this was at the peak of the harvest season when every car counted.

Previously, considerable difficulties arose when supplying district garrisons with fuel. The computer again helped in overcoming them. Having made the requisite calculations, the construction of large mechanized warehouses with reliable access roads was begun. The unloading of the cars was also mechanized

there and therefore the necessity of taking personnel away from combat training was eliminated. Instances of idle car layovers were sharply curtailed and the fuel delivery became more inexpensive. Expenditures for the construction of the warehouse complexes were quickly paid back.

By looking at a problem in a new way and calculating the variants it is possible to make a correct, economically valid decision. Considering the importance of accelerating the turnover rate of cars, we are striving to substantiate all shipments economically by means of computers. The computer not only speeds up the computational process, but also assists in selecting the optimal variant: the one most advantageous from the viewpoint of saving funds.

Unfortunately, practice shows that even a "smart" computer is powerless if the requisite organizational work is not done on site. I cite the following example by way of confirmation. Not so long ago our service participated in supporting one of the northern construction projects with rolling stock. It was necessary to ship reinforced concrete structures from the neighboring district to the northern project in a short period of time. Having calculated our capabilities, we came to the conclusion that we were able to give a green light to the entire load flow.

And in fact, the cars arrived on location strictly in accordance with the schedule. But problems arose in getting them unloaded. The builders were not ready for them. The requisite equipment had not been concentrated at the site and they worked in the old way, doing things manually. As a result, a bottleneck occurred at the station. The construction of the facility was held up. The installation of equipment directly from the cars, as was planned initially, had to be given up.

It must be noted that the military communications service has particular complaints against the construction units of the district. More than half of all idle layovers of rolling railroad stock is due to them. The same units are among the violators from year to year. Measures are taken against their commanders. Thus, for example, Lt Cols B. Maslov and A. Zaremba and certain other offices, who still have not learned how to take care of public property, had to compensate for the losses incurred, and partially from their own pocket. However, it is thought that even more severe measures should be taken.

There are examples though of things being the other way around. They have long since forgotten of idle car layovers, and this means also the fines, at the district warehouse, where the chief is Col P. Shemchuk, and in some other units and subunits. The issue is not only one of the complete mechanization of loading and unloading operations and the clear-cut organization of labor. There is a purposeful effort to educate the troops in being thrifty in these military collectives. They strive to economize both in large and small things and are constantly seeking ways to efficiently utilize transportation.

The combat units where they are seriously engaged in march training are making a considerable contribution to the common money-box and are devoting

the requisite attention to the training of personnel in railroad shipments and hurry to rapidly accept the shipments intended for them, even if they arrive at night, on days off or on holidays. Here there is an assiduous, economic and state-minded attitude toward the use of transport.

Unfortunately, this is far from being the situation everywhere. And it is thought that some disciplinary measures and material actions will hardly be able to change the situation in a fundamental fashion. Analysis shows that many commanders at times manifest poor economic management, do not worry about savings because they do not want to and because they do not know how to do it. And not surprisingly.

We ask the question: where and by whom are the commanders taught to handle the economic management of a company, battalion or regiment? To operate in a careful and economic fashion? We will not find the answer to this in the commander training plans. Regimental economics, as is well known, has been around for some time, nonetheless, even the graduates of the military schools, assigned as regimental commanders, frequently experience difficulties specifically in questions of economics. Because they know very little about it.

The serviceman, to be sure, must receive the requisite minimum of economic knowledge while within the walls of the school. There he should not only become familiar with computers, but also acquire programming skills. The majority of young officers as yet know only by hearsay about the standard indicators, shall we say, for the loading of equipment on railroad rolling stock. For this reason, they cannot organize it as it should be. This is yet another question requiring its own solution.

The plan of the Major Trends of USSR Economic and Social Development calls for the coordinated development of the nation's integrated transportation system and the elimination of inefficient shipments. We, the military, have been assigned a significantly place in this great work. Here, everyone can and must make his own contribution. And one must start with studying, with gaining even elementary economic knowledge. Lack of knowledge is quite unprofitable. Just as poorly made joints in an open track, it interferes with a rapid advance.

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GOSSNAB CALLS FOR NEW COMPUTER TIME ACCOUNTING PROCEDURES

Moscow MATERIALNO-TEKHNICHESKOYE SNABZHENIYE in Russian No 1, Jan 86 p 70

[Article by S. Babayan, Deputy Director of the Republic Computer Center of the Armenian SSR State Committee for Material and Technical Supply, Yerevan, "One Planning Paradox"]

[Text] The course adopted by the party towards the greatest possible savings of material resources imposes considerable obligations on us also, the workers of the computer centers of the USSR Gossnab. One of the primary sources used by us is computer time.

The efficiency of machine time utilization depends in many regards on the technology selected for data processing, the quality of the programming, the technical condition of the computer and the skills of the operational personnel. There are latent reserves here which make it possible to reduce the time needed for the solution of particular problems by a factor of several times. However, there is still one "but". The major indicator for the evaluation of computer center operation within the USSR Gossnab system is the volume of computer services rendered, a considerable portion of which is the total cost of the machine-hours used.

A paradoxical situation has come about. If one of the operators speeds up the processing of some particular tasks, then the computer center, having presented the customer with the official document, taking into account the actually expended machine time, does not fulfill the plan for rendered services and the entire staff is deprived of the bonus awards. But the one who spends too much machine time and induces the customer to pay him for it, proves to be among the leaders.

Thus, the existing system for planning and monitoring the activity of a computer center artificially retards the implementation of advanced technologies and innovations. Some advocates of such planning practice object: they say, the computer center itself should find ways of putting the saved machine time to good effect. But how is this to be done if all of the tasks are planned beforehand, and the introduction of new tasks during the year is not supported by income from customers? It turns out that if you have found a method of saving machine time, let us say in January, then you can use it only in the following year. But then it is not economically advantageous

for the computer center to curtail expenditures of machine time, because according to the criteria of the USSR Central Statistical Administration, the good staff is the one whose computer operates around the clock.

In our opinion, the time has come to define norms for the cost of all tasks handled on computers in our system as a function of the type of machines, volumes of incoming and outgoing information, and when new tasks are introduced, the automated control system designers are obligated to determine the standards for the machine time expenditures as a function of the information volumes. The final product is to be considered the output forms. When agreements are concluded with customers, the cost of the work must be determined on the basis of the indicated norms. Under these conditions, a computer center will be interested in saving machine time and finding a consumer for it. In this instance, the additional income should be partially directed towards the stimulation of such activity.

One frequently happens to hear that the tasks that are handled are similar while the programs are different, and it is therefore difficult to compare the operation of computer centers. But on the other hand, the implementation of a standard determined with respect to progressive program variants will force managers to find ways for the most efficient performance of the tasks.

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USE OF AN SM-8514 COMPUTER IN A GROUP CONTROL SYSTEM FOR NUMERICAL CONTROL MACHINE TOOL BAYS

Moscow AVTOMOBILNAYA PROMYSHLENNOST in Russian No 2, 1986 pp 5-6

[Article by A. M. Medvinskiy, V. Yu. Vekslyarskiy, and L. I. Zhitnitskiy, NIIRavtoprom Institute]

[Text] The principal components of flexible automated bays and facilities currently being introduced at enterprises of the industry are, as is known. automated control systems for planning, management, and real-time coordination of equipment operation.

These control systems are based on one or several mini- and/or micro-computers, depending on the complexity of the facility and the adopted control structure. As a rule, the computers incorporate systems providing communication with remote external units (in this case, numerical control [NC] machine tools). One such system is the SM-8514 data transfer multiplexer, which is used for transmitting information between the computer and the machine tools along channels with a standard radial sequential interface with high noise immunity.

The multiplexer is intended for connecting video data terminals or similar devices with the computer. It can, therefore, be connected only with local automation devices or interfaces capable of simulating the operation of such video data terminals.

Information exchange between the computer RAM and the external devices (NC machine tools) is effected through device drivers. They also analyze and transform the information before inputting it into the device. If the computer is hooked up with a large number of simultaneously operating terminals (and there is a large output of large data files). it will be engaged mainly in terminal servicing. Therefore, as has been demonstrated, no more than two SM-8514 units should be hooked up with one computer.

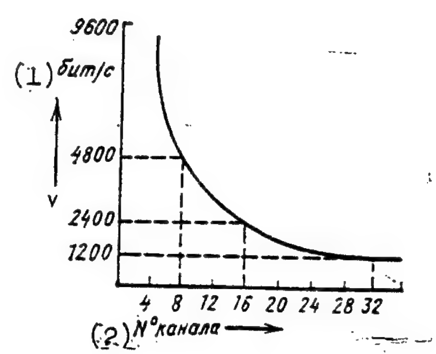
The second limitation is associated with the handling capacity of the common bus. The thing is that in computers based on this interface, at any given moment two devices may take part in data exchange, one input and one output.

All other devices requiring transmission via the common bus must wait for the end of the data exchange. Naturally, the greater the number of parallel operating units the greater the waiting time for access to the common bus, which may exceed the permissible maximum. (According to data of a seminar on the operation of SM computers, the maximum aggregate transmission rate via SM-8514 channels should not exceed 38,400 bits per second.)

To avoid this it is useful to organize sequential-parallel rather than sequential data transfer to all external devices, especially because the opportunity for this exists, since the multiplexer implements byte-by-byte data exchange over each channel. For optimal loading the input-output time for all operating multiplexer channels should not exceed the duration of two-way transmission of one byte over one channel.

The third limitation is in the number of external devices connected with the multiplexer and the speed of data transfer over the communication channels. These restrictions are imposed by the number of operating communication channels, the sequence of data transfer from the computer to the external devices, and the control program wait time.

Thus, Fig. 1 shows the dependence of the data transfer rate, v, on the number of operating communication channels, taking into account the permissible maximum aggregate transfer rate over all channels and the range of nominal transfer rates over a standard radial sequential interface. As the figure shows, with an increase in the number of communication channels the transfer rate over each of them declines. It is therefore necessary to find a certain optimum of both number of channels and data transfer rate. Experience shows that such an optimum indeed exists and corresponds to a data transfer rate of 1,200 to 2,400 bits per second and 8 to 24 operating communications channels.



Key:

1. Bits per second

2. Channel number

Fig. 1

From the possible algorithms of data transfer between the computer and the interface devices (for example, for hooking up NC machine tools or local automation devices) for systems developed by NIIRavtoprom, the following procedure was adopted: Data from each of the RAM areas assigned to each of the external devices hooked in via the multiplexer are loaded byte-by-byte

into the multiplexer communication channels and supplemented by information required for their asynchronous transfer. (The format of the transmitted signal is presented in Fig. 2.)

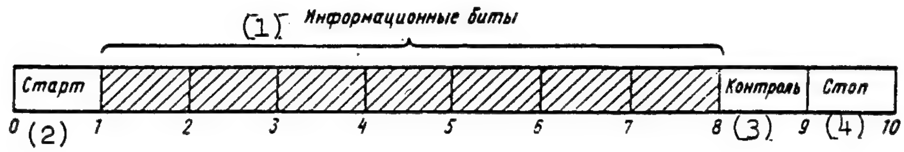


Fig. 2

Key:

1. Information bits
2. Start
3. Control
4. Stop

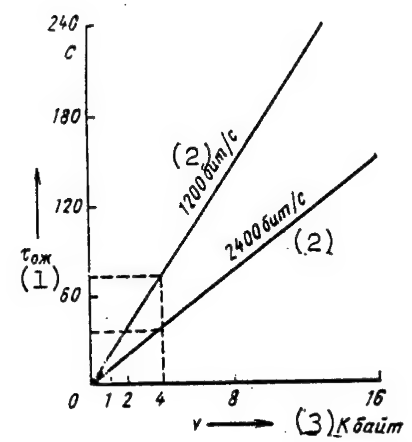
Acknowledgment is used to enhance transfer validity, i.e., the transmitted symbol is transferred to the external device and returned from it to the computer. The computer compares the transmitted symbol with that received from the interface, and if they coincide sends the next data byte to the communication channel. If the symbols do not coincide the symbol is repeated up to three times. If the signals still fail to coincide transmission over the given channel is suspended.

After sending a data byte to one of the SM-8514 channels the computer retrieves a data byte from its memory and transmits it to the next channel, etc. For optimal channel loading byte distribution to all operating channels should not exceed the transmission-reception time over one channel. Thus, at a transfer rate of 1,200 bits per second and symbol format as shown in Fig 2, the transmission time of one byte is 16.7 ms. For a rate of 2,400 bits per second it is one-half that time.

The volume of transmitted information depends on the function algorithm of the flexible automated bay or facility, the control program capacity, type of manufactured parts, etc. It is different for every specific group control system. However, accumulated experience shows that volumes that are either too small or too large should be avoided. For example, in frame-by-frame distribution the processing of one frame of the control program by a machine tool (e.g., a milling machine) may be commensurable with the transmission time from the computer to the interface, which can lead to extensive machine tool downtime, on the one hand, and computer operation only in the control distribution mode, on the other. Transmission of excessively large volumes of information can lead to excessive wait time of the control program's external device, thereby reducing the production equipment's efficiency. It is therefore best to set the amount of information stored at the controlled unit (NC machine tool) at 4-16 Kbytes. The optimal variant is for the buffer memory to be divided into two zones of 4 or 8 Kbytes, respectively. When the first zone is filled the unit can start running the program while the second zone is being filled. After the program stored in the first memory zone is run

control can be transferred to the program stored in the second zone, while a new program can, if necessary be inputed into the first zone.

Fig. 3 shows the dependence of the wait time of the control program on the amount of information and rate of data transfer. As can be seen, transfer of 4 Kbytes of information at a rate of 1,200 bits per second requires slightly more than one minute, and slightly less at 2,400 bits per second.



Key:

1. Wait
2. Bits per second
3. Kilobytes

Fig. 3

In conclusion we should note that when selecting the optimal data transfer rate and number of external devices hooked up to the automated group control system via the SM-8514, it is necessary to take into account the specific features of the manufacturing equipment, the function algorithm of the flexible automated bay, restrictions in multiplexer use, and recommendations regarding the optimal rates of data transfer and number of hooked up external devices.

Thus, the rate of data transfer between the computer and NC machine tools which have short control program frame processing time, should be equal to 2,400 or 4,800 bits per second, whereas for "slow" NC tools and automated transport and storage systems it should be 1,200 bits per second. A portion of the SM-8514 can also be used for communication with remote video terminals.

9681
CSO: 1863/190

PRODUCTION IMPROVEMENTS AT TBILISI 'ELVA' COMPUTER MANUFACTURING PLANT

Tbilisi ZARYA VOSTOKA in Russian 12 Jan 86 p 1

[Article by Yevgeniya Mikhaylova, "Greeting the 27th Party Congress in a Worthy Manner through Modernization"]

[Text] The collective of the Tbilisi control computer plant of the "Elva" scientific production association is faced with a large amount of work on the introduction of new equipment and progressive technology, the reduction of the percentage of manual labor as well as the automation and mechanization of production processes in the 12th Five-Year Plan.

The workers in the shops and sections of the primary and auxiliary production operations as well as the 12 comprehensive and specialized brigades were engaged from the first days of the new year in the socialist competition to greet the 27th CPSU Congress and 27th congress of the Georgian Communist Party in a worthy manner.

In the individual socialist competition in honor of the 27th CPSU Congress, going forward in the front ranks are Galina Biryulkina, a welder in the plastics section, Anzor Labadze, an electric and gas welder in shop No. 20, Mziya Khuroshvili, a fitter in the drilling section and Anatoliy Kopylov, a metal worker in mechanical assembly operations.

"In the present five-year plan," states A. Tsanava, secretary of the party committee, "the key problem for our plant is retooling. We are confronted in practice with the resolution of the tasks assigned by the June plenum of the CPSU Central Committee related to aspects of scientific and technical progress, and work has already been started in this area. In particular, a new electroplating production line is being installed, which will improve the quality of printed circuit boards - the 'hearts' of computers that assure their reliability. An automated painting line is being placed in service which will make it possible to free eight standard workers and significantly improve the quality."

In the 12th Five-Year Plan, the control computer plant is faced with the retooling and reconstructing of the preparatory, casting, welding and frame

stamping shop No. 1 and mechanical shop No. 8, as a result of which no less than 1,000 workers will be conditionally let go, about three million rubles will be saved and the production capacities will increase.

Having thoroughly discussed the available options for placing production reserves in service, enhancing production efficiency and fully supporting the initiative of the "AvtoVaz" association, the collective of the enterprise recently assumed the obligations for the 12th Five-Year Plan at the general party meeting. Ahead for the plant is the task of placing 10 new products in production, including 5 new computer models.

It is planned that the technological process of blow-off extrusion molding of plastic products will be introduced in the first year of the five-year plan. The collective has decided to attain an additional growth in labor productivity with respect to commodity production of 5.2% above the plan by the end of 1990, show a growth in production of 117.5% over the five-year plan, produce goods in the amount of two million rubles above the five-year plan requirements and generate an income of 250,000 rubles above the plan for the five-year plan based on the acceleration of scientific and technical progress, specialization, comprehensive mechanization and automation.

The accepted obligations are mobilizing the collective for the timely and high quality implementation of the concluded agreements, the reduction of the maximum level of expenditures per ruble of commodity output as well as the improvement of the work quality and activity of each worker and the entire collective.

8225
CSO:1863/185

UDC 621.375.1-529

PROMISING METHODS FOR IMPROVING ACCURACY AND SPEED OF PROGRAMMABLE AMPLIFIERS FOR COMPUTER INPUT/OUTPUT SYSTEMS

Moscow IZMERENIYA KONTROL' AVTOMATIZATSIYA in Russian, No 2, Feb 85, pp 38-48

[Article by Doctor of Engineering Sciences Ye. Polonnikov and Engineer N. V. Dmitriyev]

[Abstract] Methods for improving the accuracy and speed of amplifiers with digital programmable gain are reviewed and analyzed. Such amplifiers match the levels of a widely varying input signal to the full-scale voltage of the analog-digital converter, making it possible to perform conversion with the maximum possible word length for input signals with wide dynamic ranges. Methods for increasing speed based on expanding the amplifier bandwidth are outlined. Methods for improving accuracy by increasing the gain of an open dc amplifier. Methods for increasing accuracy of speed based on stabilizing the absolute value of the amplifier gain with the help of a negative feedback loop are described. Differential amplifiers for difference-signal processing, or for use in case of co-phased interference, are discussed. The methods examined can be used widely in developing high-throughput microcomputer input-output devices. Figures 12, references 17: 12 Russian, 5 Western.

6900/12955
CSO: 1863/500

UDC 681.327

REDUCTION OF RELATIONAL MODEL WITH INFINITE DOMAINS TO CASE OF FINITE DOMAINS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 286 No 2, 1986
(manuscript received 29 Jul 85), pp 308-311

[Article by A. K. Aylamazyan, M. M. Gilula, A. P. Stolboushkin and
G. F. Shvarts, Institute of Problems of Cybernetics, USSR Academy of Sciences]

[Abstract] An analysis is made of the problem that the initial relations stored in a relational data base are always finite, but that the domain of truth of a relational calculus formula (i.e., an answer to a query), may be an infinite set, and hence not computable. It is shown that the set of queries that are constructive (i.e., can be translated into algorithmic language and computed within a finite number of steps as a finite relation) for any status of the data base is not resolvable. The problem is posed in terms of predicate calculus, or relational calculus with variables on the domains. All of the attributes are assumed to be defined on one finite domain, and only the equality operator is permitted. The ideas expressed are also applicable in realizing query languages over finite, but very large, domains, when the actual region does not exhaust the entire domain. References 5: 3 Russian, 2 Western.

6900/12955
CSO: 1863/204

UDC 62-50

THE QUASI-SPLITTING METHOD AND ITS APPLICATION FOR SYNTHESIZING AUTOMATIC CONTROL SYSTEMS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 286 No 2, 1986
(manuscript received 3 Jun 85), pp 311-315

[Article by Academician V. Yemelyanov, S. K. Korovin and I. G. Mamedov, All-Union Scientific Research Institute for Systems Investigations]

[Abstract] A quasi-splitting method is described for synthesizing automatic control systems for objects with large dimensionality that is related to the Lyaponov vector functional method, the integral manifold method, the point mapping method, the decomposition method, and the singular perturbation method. The quasi-splitting method can be applied to the regulated dynamic system before the control function is selected, and with limited information about the characteristics of the object. The method admits a clear geometric interpretation, and makes it possible to investigate in detail the properties of all decisions in a closed control system. An automatic control system is synthesized within the framework of the quasi-splitting method by selecting the control from the class of acceptable controls for which specified conditions are satisfied. Examples of automatic control system synthesis are presented. References 12: 11 Russian, 1 Western.

6900/12955
CSO: 1863/204

UDC 681.511.2

ESTIMATION OF PARAMETERS OF MULTIDIMENSIONAL REGRESSION MODELS

Moscow IZMERENIYA KONTROL' AVTOMATIZATSIYA in Russian No 2, Feb 85, pp 75-84
[Article by Candidate of Engineering Sciences, L.P. Sysoyev]

[Abstract] A class of linear regression models is considered in which multidimensionality, i.e., the presence of a large number of input quantities and unknown parameters, is investigated. The least-squares parameter estimation method is described, and simplified adaptive algorithms for computing such estimates are outlined. The Bayesian approach to accounting for a priori information is explained. Biased and robust estimation are investigated, as well as estimation for unknown noise characteristics. Areas for further work are suggested. References 57: 25 Russian, 32 Western.

6900/12955
CSO: 1863/500

UDC 658.012.011.56:681.3.06

STATUS AND TRENDS OF DEVELOPMENT OF PROCESS CONTROL SYSTEM PROGRAMMING

Moscow IZMERENIYA KONTROL' AVTOMATIZATSIYA in Russian, No 3, Mar 85, pp 53-63

[Article by Candidate of Engineering Sciences, K. Ya. Davidenko]

[Abstract] This article presents a review and comparison of approaches to process control system programming. The characteristics of process control systems that are significant in terms of their programming are outlined. The characteristics of control programs are described, and the importance of quality control is emphasized. Parametrization, configuration, and free programming approaches are explained. The basic evolutionary trends in process control system programming are described. The features that process control system programming must exhibit are enumerated. Figures 4, tables 3, references 18: 8 Russian, 10 Western.

6900/12955
CSO: 1863/500

UDC 618.52

IMPROVEMENT OF PERFORMANCE OF LOCAL STABILIZATION SYSTEMS OF AUTOMATIC CONTROL SYSTEMS FOR CONTINUOUS TECHNOLOGICAL PROCESSES

Kiev AVTOMATIKA in Russian No 1, Jan-Feb 86 (manuscript received 20 Sep 85, pp 76-79

[Article by G. M. Bakan, V. V. Volosov and A. S. Kalita, Institute of Cybernetics imeni V. M. Glushkov, Ukrainian SSR Academy of Sciences]

[Abstract] A correction algorithm is derived to improve the operation of local stabilization systems employed with automatic control systems for continuous technological processes that provides greater flexibility and broader capabilities than a similar algorithm developed previously by the authors. The effectiveness of the proposed algorithm is illustrated by an example. Figures 3, references: 2 Russian.

6900/12955
CSO: 1863/501

UDC 681.513

CONSTRUCTION OF MIXED SPACES IN PATTERN RECOGNITION LEARNING PROCESS

Kiev AVTOMATIKA in Russian No 5, Sep-Oct 85 (manuscript received 11 Jun 85) pp 3-8

[Article by V. I. Vasilyev, F. P. Ovsyanikova and R. I. Tsoy, Cybernetics Institute imeni V. M. Glushkov, Ukrainian SSR Academy of Sciences]

[Abstract] This study extends previous work by the authors on the problem of pattern recognition learning, which is interpreted as a procedure of constructing a space within which it is possible to separate patterns easily. It is shown that a mixed feature space can be constructed by using features that have different properties so that the patterns can be separated linearly. The construction of spaces of pseudo-features is investigated, and the complication of the decision rules is discussed. References: 5 Russian.

6900/12955
CSO: 1863/501

UDC 681.325

COMPRESSION OF DATA REPRESENTED IN NUMBER SYSTEM WITH ARBITRARY BASES

Kiev AVTOMATIKA in Russian No 5, Sep-Oct 85 (manuscript received 24 Sep 84) pp 72-75

[Article by V. V. Kolomeyko, Cybernetics Institute imeni V. M. Glushkov, Ukrainian SSR Academy of Sciences]

[Abstract] Data compression methods based on the joint coding of two bits (digits) are investigated. An algorithm is presented for minimizing the number of bits involved in recoding in order to simplify compression and recovery. The proposed method makes it possible to standardize compression and recovery circuits, and thus to make it easier to use LSI circuits. The use of these units in processing information represented in number systems with bases that are not equal to a whole power of 2 makes it possible to increase the efficiency of communications channels and storage devices by 10-14%. References 5: 4 Russian, 1 Western.

6900/12955
CSO: 1863/501

UDC 681.3.06

BASIC FEATURES OF PS-3000 OPERATING SYSTEM SUPERVISOR

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 10, Oct 85
(manuscript received 12 Sep 84) pp 153-159

[Article by A. Z. Ioshpa, P. G. Miroshnichenko, V. M. Rabinovich,
E. A. Trakhtengerts, Ye. V. Shcherbakov and V. S. Yavnilovich]

[Abstract] Features of the operating system supervisor that are governed by the architectural specifics of the PS-3000 computer system are investigated. The supervisor controls parallel processes and task subprograms, handles exceptional situations occurring while executing tasks, synchronizes parallel processes within a task, controls main memory, and handles the timing service for use by tasks. The aspects of these functions that are governed by the parallelism of the tasks performed and the use of special processors (peripheral subcomplexes) are emphasized. References: 1 Russian.

6900/12955
CSO: 1863/502

UDC 681.3.06

PREVENTION OF DEADLOCKS IN PARALLEL PROGRAMS RUN ON MULTIPROCESSOR COMPUTERS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 10, Oct 85
(manuscript received 11 Jul 84, pp 160-168

[Article by V. V. Parshentsev]

[Abstract] A method is proposed for preventing deadlocks based on preliminary analysis of the structure of the parallel program or group of programs operating in parallel. By analyzing the parallel program statistically, resources are identified that are potentially hazardous from the viewpoint of deadlocking; requests for these resources are then referred to the beginning of the parallel branches. An algorithm for converting parallel programs to a safe form is presented. The proposed method makes it possible to avoid deadlocks in parallel programs with limited synchronization. Figures 5, references 7: 1 Russian, 6 Western.

6900/12955
CSO: 1863/502

MICROPROCESSORS AND AUTOMATED SYSTEMS

Kishinev IZVESTIYA AKADEMII NAUK MOLDAVSKOY SSR, SERIYA FIZIKO-TEKHNICHESKIKH I MATEMATICHESKIKH NAUK in Russian No 3, 1985 pp 10-14

[Article by I. F. Klistorin]

[Text] The appearance of microprocessors radically changed the use of computer hardware, imparting to this phenomenon mass use and unusual breadth. (Footnote 1) (From materials of the scientific report at the annual General Meeting of the Moldavian SSR Academy of Sciences, 11 April 1985) It is assumed that information processing through the use of microprocessors will be used at practically every workstation during the next few years. However, a number of problems arise in the path of their widespread use in the national economy, the main one of which--lack of training of users (specialists of different fields of the national economy) in the use of computer and microprocessor hardware--is becoming a barrier to an increase of labor productivity and mainly in the sphere of information processing [1, 2].

The socioeconomic prerequisite for universal computerization of modern society is the need for mass information processing, in which a considerable part of society is now engaged.

Material production was the main object of labor up until the last third of the 20th century. Activity beyond this was related to nonproduction expenditures. The economic might of a state was measured only by material resources. Information is also becoming the main object of labor in the social production of the industrially developed countries at the end of the 20th century. This switching of labor resources from material production to the information sphere has a stable tendency to increase.

Here are some examples that confirm this phenomenon.

Total expenditures for generation, transmission and consumption of energy by the late 1980's was stabilized at the level of 13 percent of the gross national product (GNP) in the United States after multiple increases of prices for oil--the main energy carrier. But the fraction of expenditures for electronics and computer hardware comprises 10 percent of the gross national product. For comparison: 2-3 percent of the GNP goes to agriculture, 4 percent goes to the construction industry and 28 percent goes to all sectors of American industry (processing, producing and so on) taken together [3]. An increase of the number of people involved in the information sphere was also determined by

the fact that the rates of increase of labor productivity lag well behind the production sphere. Thus, the rates of increase of labor productivity in automated sectors of the process industry comprised approximately 80 percent over 10 years, while the increase of so-called white-collar workers was no more than 4 percent over this same period [3]. Universal computerization on the basis of microprocessors makes it possible to solve this problem.

Extensive introduction of microprocessor technology into the national economy will support development of new machines and units, an increase of labor productivity in production, in manangement, in design, science and institutions, improvement of the quality of teaching and occupational training and so on.

Microprocessors are a large-scale integrated circuit (LSI) or very large-scale integrated circuit (VLSI), having the capability of processing information through program control, including input and output of information, arithmetic and logic operations and also decision-making.

All information processing units and systems until now, i.e., practically all radio electronics, were based on so-called "hard logic." Functional algorithms, characteristics and parameters of machines, devices, units or systems essentially cannot be changed after manufacture without fundamental modification. A product is frequently obsolescent even before serial production of it begins and the more complicated it is, and accordingly the more expensive it is, the greater the losses are. At the same time, one of the main characteristics of the present are high rates of developments and rapid changes in the characteristics of equipment and its software. Engineers, programmers and investigators are faced with a very complicated problem--to combine stability of characteristics with adaptability to new conditions, constant modification and the capability of use of new engineering solutions during design. Microprocessors provide this flexibility due to the capability of rearranging them [2].

The following spheres of automation of information processing began to be developed autonomously in the early 1960's: automated control systems (ASU) from the individual shop to sectors of the national economy, automation of production equipment, automated production process management systems (ASU TP), industrial robots (PR) and computer-aided design systems (SAPR).

Let us consider some aspects of the indicated spheres.

Industrial robots. It has been accepted to separate any type of equipment into generations. It has become accepted to assume the methods of control as the basic classification of robots according to generations: first generation--robots with program control, second generation--those with adaptive control and third generation--those with intelligent control. The greater part of robots being operated at present are part of the first generation and are characterized by comparatively low cost during serial manufacture. The main advantage of robots with program control is that they have a considerable range of production applications with sufficiently simple design version and are more efficient in monotonous-cyclic operations with comparatively rare readjustments to a new type of work. Therefore, the need for simple programmed robots will not decrease according to forecasts of specialists and they are being improved successfully [4].

One can site many examples of using industrial robots in different types of production and primarily in those harmful to and not accessible to humans. Robots are being introduced in even such low-automated sectors as the maintenance sphere, for example, the Catering Kombinat, Industrial Association VEF [Riga State Electrical Engineering Plant] imeni V. I. Lenin. Incidentally, industrial robots with program control do not meet the needs of new tasks determined by disruption of the strict ordering and organization of the protection environment in which they operate. Therefore, robots supplied with sensing and adaptation units and which technically reproduce individual intelligent functions inherent to man are now being developed intensively.

Successful solution of the problems of design and introduction of robotics has become possible with the appearance of microprocessors. Microprocessors not only provide flexibility and intelligence of industrial robots, but also provide the economic feasibility of mass use of them in practically all sectors of the national economy.

Computer-aided design systems. A new scientific and technical direction--computer-aided design systems (SAPR)--appeared in the late 1960's. Automation of calculations in the batch mode on large mainframe computers (of that time) and solution of machine graphics tasks on peripheral equipment (graph plotters) were provided during the first phase of development. Automation of these tasks--more laborious and routine--made it possible to solve the problem of computing and graphic operations in a number of sectors of industry and primarily the electronic and machine-building industries.

The second phase of CAD--design and development of automated workstations (ARM) for the designer--is related to the appearance of small computers and development of the peripheral equipment. The first automated workstations appeared and were developed in electronics. Design and development of integrated electronics of medium and especially large-scale integration and also complicated radio equipment and computer hardware based on it would be very problematical without automated workstations. Automated workstations later appeared in machine building, construction and other sectors. A characteristic feature of using an automated workstation is introduction of the interactive mode of the designer working with the computer. However, new even more complicated problems were detected upon solution of the indicated problems.

Design and development of the second generation of automated workstations became realistic only with the appearance of micrpprocessors and microcomputers based on them, which can technically and economically be built into peripheral equipment and which permit execution of a large-scale task (i.e., a very complex task) in parallel.

Simultaneous parallel operation of several (four or more) designers on solution of various tasks is achieved with introduction of ARM-2. The central processor of the automated workstation--a small computer--has sufficient computing power to solve a very large number of tasks encountered in practice in the offline mode, i.e., without a mainframe computer. This radically reduced the cost, increased the mobility and accelerated the process of product design. Modern small computers, for example, the SM-14-20, correspond to such mainframe computers as the YeS-1022 and YeS-1033 in their computing capabilities,

primarily in speed and memory capacity, or exceed them, and at the same time they are much less expensive in operation and incomparably easy to operate.

The next phase was integrated computer-aided design systems. They are understood as a single line or technology of a product design process, which includes methodological, information and engineering fundamentals. This phase began approximately in the 1980's and is being developed vigorously. Computer-aided design systems now link product manufacturing technology into a unified process, which has been named flexible automated manufacturing (GAP). It is possible when the object of production--the product--will be designed in the appropriate manner, i.e., it will be adapted to this manufacturing to the optimum extent.

An integral part of computer-aided design systems and namely the information base are automated product checking and diagnostic systems. They also have a different designation, outside the computer-aided design system, as a continuous component of the production process in manufacture of a product and are one of the main means of providing given product reliability. It is known that expenditures for checking and diagnosis in electronics reach 50-60 percent of the cost of manufacture and the more complicated a product is, the higher the cost fraction is.

Automated checking systems (ASK) and automated digital electronic equipment diagnostic systems are the basic direction of research of the Department of Design and Production of Electronic Equipment (KPEA), Kiev Polytechnical Institute imeni S. Lazo. This research was included in the integrated goal CAD program, coordinated by USSR Minvuz [Ministry of Higher Educational Institution], during the 10th and 11th Five-Year Plans. The principle of organizing automated checking systems that utilize the modular method of design of electronic equipment, problem-oriented programming language TEST and the TEST operating system based on it, were developed during this period. The principles of organizing the automated checking system and TEST operating system were the basis for OKR [design and development work], conducted by the sector of the SKB [special design office] of the Kishinev Plant Signal, which are incidentally almost completely staffed by graduates of the department. The TEST-7901 automated system, now manufactured serially by the plant for checking essentially all its products and for equipping the enterprises of the sector, was developed. The indicated principles of organizing the automated checking system, TEST language and the operating system were widely distributed in other sectors of industry as well due to transfer of the department's scientific and technical developments to a number of scientific research institutes and design offices. For example, serial manufacture of an automated checking system of type IVA-2015 based on the Elektronika-60 microcomputer is beginning.

One of the areas where application of microprocessors is the most effective and most massive is measuring and monitoring units. Building microprocessors into them (and it becomes economically feasible) permits a radical increase of metrological and operating characteristics of measuring and monitoring units. An example can be the microprocessor analog-digital converter (ATsP) for measuring the integral characteristics of periodic signals, developed at the department. It is not inferior to the best models of the leading foreign companies in its metrological characteristics and exceeds them several-fold

in speed--the most important parameter of analog-digital converters. The converter is presently being prepared for transfer to experimental design work [5].

The use of microprocessors aggrevated the problem of monitoring and diagnosis of them even more than electronic equipment, designed on "hard logic." This was caused by such a characteristic feature of microprocessors as the capability of alteruing their functional algorithm and characteristics under program control. One of the microprocessors has a set of functional versions such that design of tests for monitoring it with acceptable completeness is problematical in the foreseeable future. Accordingly, other means of designing monitoring and diagnostic systems for microprocessor systems must be found.

Investigations are now being conducted at the department on development of a new, nontraditional structural linguistics approach to design of automated checking systems, based on the use of pseudo-random testing with inclusion of elements of artificial intelligence. The main idea of this approach is introduction of feedback to the process of generation of checking test effects, the structure of which is given by humans in the interactive mode with the computer on the basis of information available to it about the object of checking, including unclear information. The system is seemingly taught [6, 7].

The main advantage of the structural linguistics approach is freeing man of routine work on executing numerous small, but crucial operations in synthesis of the checking algorithm (test) under conditions of a rapidly changing list of products to be checked. The process of synthesis and generation of functional tests can be combined in this case, the reliability of functional checking can be improved under conditions of a priori uncertainty and the process of adapting the system to the checking object can also be accelerated.

The Lingvist 601S automated checking system based on the Elektronika-60 microcomputer for testing digital assemblies containing up to 40-50 medium-scale integrated circuits, was developed and underwent experimental operation on the basis of the structural linguistics approach. The effectiveness of checking these products, including the speed of developing the tests, is approximately an order of magnitude higher than that of the best Soviet machine systems while retaining completeness of checking. The Lingvist 802MP automated checking system for checking microprocessors and the Lingvist 802D system for dynamic checking of them is now being developed on the basis of the same Elektronika-60 microcomputers.

Further improvement of these systems is planned in the direction of increasing the number of artificial intelligence elements, amplification of it and simplification of man-system communication. One of the directions of automated checking systems is pattern recognition. Its essence includes processing experimental data to determine regularities and principles in them. One of the basic problems in pattern recognition is search and selection of the most informative parameters or features by which a decision is made efficiently (in speed, cost, laboriousness and so on). Different methods and approaches are used for this. Specifically, the logic-combinatorial method, one of the advantages of which is the capability of working with data having different dimensionality, different nature and distributed differently under conditions of a priori

uncertainty, has been specifically proposed and is being developed at the department [8].

Criteria of the information content and combining the search for more informative features with the process of constructing a decision rule have been proposed on the basis of the logic-combinatorial method. The corresponding software and hardware have been developed for practical implementation of this method. The hardware is a special logic processor, assembled on microcircuits of series 155 with medium-scale integration. Nevertheless, the use of a microcircuit series, even far from the best in capabilities, made it possible to demonstrate the high efficiency of the special processor in fast information processing for decision-making.

The results of software and hardware are being used by the Moldavian Hail-Protection Service to identify the degree of hail hazard of clouds, and jointly with the Institute of Ecological Genetics, Moldavian SSR Academy of Sciences, it has begun investigations on recognition of biological objects.

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ELECTRONIC CATALOG

Moscow TEKHNIKA I NAUKA in Russian No 1, Jan 86 pp 31-32

[Article by V. Korneyev]

[Text] Searching for information on computer software and the development of algorithms at the USSR State Public Scientific-Engineering Library [GPNTB SSSR] has been speeded up severalfold. Such has been the result of introducing the electronic catalog that has been created here.

The GPNTB SSSR is the largest scientific-engineering library in the country. The specialized store of literature on computer software and the development of algorithms that has been created here in recent years is great. The demand for publications from this specialized store is not small; they are necessary for both scientific research and for practical developments.

"And with such a demand," states Deputy Science Director of the GPNTB SSSR V. Rostovtsev, "until recently there existed...a paradox. Imagine: specialists studying topics dealing with computer software and adapting it to specific problems of the economy referred to the store. Their problem was to process data at high speeds. And here these people who are called upon to economize minutes and seconds of computer time had to spend minutes and even hours retrieving information about the literature that they needed using a traditional card catalog...

It became necessary to automate. A system that was practically geared toward the existing functional subdivisions of our library was developed on the basis of the YeS 1060 computer. I notice that aside from the online retrieval of information it also makes it possible to accomplish fundamentally new tasks. For example, based on information input into the computer's memory, it has become possible to automate the publication of a monthly index entitled 'Algorithms and Programs'. It has also become possible to disseminate this index on magnetic tapes among organizations having the necessary electronic equipment."

"How does your electronic catalog operate?"

"Access to the data base using a display permits the online retrieval of information about publications both by bibliographic and thematic keys. At present, such an "electronic" retrieval based on user inquiries are as a rule conducted by library specialists. It may be said that the users themselves are still trying it out (computer time is nevertheless expensive).

Incidentally, the data delivered by the computer in response to inquiries also contains the code number of the literature in the specialized store. In that way it is possible to obtain the needed publication in the distribution department at a system terminal.

I also notice that our library has a whole series of departments. We are now creating a terminal network that should encompass them. As a result, any user of any department will be able to refer to the services of the electronic catalog. It is in fact understandable that the traditional card catalog cannot provide a multiaspect thematic retrieval with various conditions and limitations. For electronics, this is realistic..."

"Vladislav Mikhaylovich, the development of your specialists has evidently already attracted attention?"

"The engineering solutions used here were recommended during its acceptance by an interdepartmental commission as standards during the creation of similar systems in large libraries.

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ARTIFICIAL INTELLIGENCE: FANTASIES AND REALITY

Moscow NEW TIMES in English No 6, 17 Feb 86, pp 24-28

[Interview with Germogen Pospelov under the rubric "Science, Technology, Man]

[Text] The draft of the new text of the CPSU Programme provides for further major progress in industrial automation in the coming decades involving a changeover to automatic factory shops and plants as well as automated control and design systems. Research directed towards what is known as artificial intelligence is closely linked with the accomplishment of this goal. Academician GERMOGEN POSPELOV, Chairman of the Artificial Intelligence Research Council of the USSR Academy of Sciences, told our correspondent Yuri Samoilov about progress so far and the outlook for the future.

Is it possible to create artificial intelligence as the public at large sees it?

This is out of the question. The human brain is an extremely complex system comprising about forty billion interconnected cells, each cell being incredibly complex in itself. There is a hypothesis that comes close to the truth whereby each individual brain cell processes incoming signals like a computer. Consequently, no machine, however perfect, can stand comparison with the human brain. "Artificial intelligence" is a metaphor for research jointly undertaken by mathematicians, linguists, psychologists, engineers, and other experts. It signifies computer intelligence, not human intelligence which cannot be created artificially.

There is another reason why your question cannot be answered in the affirmative. It was discovered in the early seventies that the two hemispheres of the human brain discharge different functions. Each hemisphere has its own mode of thinking. One thinks in terms of logic, and the other--in images. Our thinking is based on two types of perception: sensory (unconscious) and conscious. What man is conscious of and, consequently, can put into words, constitutes only a small proportion of the total work of the brain. Thinking processes do not lend themselves to direct observation. They can be judged indirectly, by the way the incoming information is transformed by the brain.

This is why we know so little about what's going on in the "imaginative" hemisphere which makes it impossible to replicate human intelligence artifically. The world of emotions, mental attitudes and the subconscious, which has a tremendous role to play in man's thinking and behaviour, is inaccessible to us so far. It is not unlikely that in the remote future machines capable of a loose imitation of human intelligence will be created. This will be made possible, however, only given a now unpredictable revolution in computer technology.

Let us try and visualize this distant future. Certain medical scientists are of the opinion that a machine possessing artificial human-type intelligence complete with emotions, consciousness and subconsciousness would be regarded as a creature entitled to all human rights.

I'd rather not discuss exaggeratedly fantastic notions which, to my mind, are unlikely to be translated into reality in the foreseeable future. Certain experts ascribe human qualities to machines without sufficient grounds. This tendency is nothing new and, in fact, has its roots deep in the history of culture. We find animated objects in fairy tales and legends. Science is not a fairy tale, however. A machine, no matter how perfect, is so much dead matter. It cannot possibly have any feelings, emotions, needs or wishes characteristic of a human being. Can you imagine a machine in love? I can't. And what about the life experience man gains in society as he constantly deals with purely human problems? A machine cannot have any thinking at all, either logical or imaginative. This is a property of highly-organized live matter alone.

But what about the biological computers, now being developed in the USSR, Japan and the USA?

Such computers have nothing to do with thinking, either. Sooner or later the potentialities of modern microelectronics will be exhausted. A changeover to the molecular level would open up new vistas of computer development and miniaturization. Introduced into the circulatory system, a tiny biocomputer would control blood chemistry, indicate the condition of blood vessels and warn of any danger of cardial infection or stroke. However, such computers are still a long way off. Up to now scientists engaged in developing the rapid-action molecular switches of future computers have tried to use self-sustained wave oscillations discovered by Soviet experts. The adherents of molecular electronics hope that the replacement of silicon microcircuits with compound organic materials will increase data recording density to an extent unthinkable today. The first steps made in this direction are most encouraging. The Biophysics Institute of the USSR Academy of Sciences, for instance, has obtained extra-thin film of "bacteriorhodopsin" protein, every molecule of which changes colour on exposure to a laser beam. Films like that are susceptible of multiple recording and erasure, and can make an ideal medium for data storage. A disc of this film the size of an ordinary LP record can hold enough information to fill tens of thousands of volumes.

Still, some scientists believe that artificial intelligence is a realistic proposition and that it could even surpass ours. More, they say it could be created by the end of the 20th century.

Such statements are made, as a rule, either by non-scientists or by experts who do not deal with this specific problem professionally and have only a superficial notion of it. True, there are inveterate optimists in our midst as well. I think these prognoses, unsubstantiated scientifically, come from the current overenthusiasm about cybernetics. The once sceptical and even negative attitude to it has now gone to the other extreme. Attempts have been made to investigate the human brain using a computer model but nothing has come of them. I am sure, however, that research into what is rather inappropriately termed "artificial intelligence" will continue to grow in importance from year to year.

Computers using advanced software aid man in his intellectual pursuits in various spheres. Automation of production should be accompanied by automation of control. A certain balance is to be maintained here lest we should come up against the phenomenon known as "information crisis." With the dramatic increase in the range of products, manufacturing processes and all kinds of services, the managerial sphere loses its hold over production planning and control processes and the flow of material. This shows in shortages in supply and failures to meet mutual delivery schedules. Almost 25 percent of all those employed in the industrialized countries (50 percent in the U.S.) are now involved in endless paperwork. If vigorous measures are not taken to computerize planning and control it will impede the growth of labour efficiency to a still greater extent.

It has been estimated that office employees' efficiency is growing at approximately half the rate of industrial workers. How can office work efficiency be stepped up?

This can be done chiefly by means of computers. Personal computers are going to be of great help in this respect. Compact and easy to handle, they make it possible to follow every calculation stage by stage and to make the necessary corrections by means of a graph plotter and a display. Moreover, they can be connected to higher-capacity computers as "intelligence terminals" and, what is no less important, organized into computer networks. The extensive introduction of these networks would mean a revolution in office work.

Could you illustrate this?

Well, supposing I am to do some calculations in the planning sphere. Upon running my initial data through a computer, I learn that the manufacture of certain products requires certain equipment and certain production facilities. I ask a neighbouring department which of my requirements it can meet, and the reply appears on my display right away. Then I run my program through the computer again, with the new data added, but the result does not suit me. I apply to another department, then to a third, and finally find what I want. In this quick and convenient way one can do a job which used to take months of correspondence.

But a telephone conversation is not a document?

A request is not merely a telephone conversation. It is also a visual display presentation and a printout. The same applies to the coordination of technical drawings. Whenever I address a colleague in another department or another institution, the drawing I want to coordinate with him and the text of my request appear on his screen. All the necessary adjustments or replacements can thus be made without undue delay.

What about signatures? Aren't documents and drawings invalid without them?

If you want to sign a document, all you have to do is to say your name distinctly into a telephone receiver. The computer will print it out, and the document will take legal effect. Every individual's voice is as unique as his fingerprints. A computer will single it out from millions of other voices stored in its memory. This rules out the possibility of "forgery." Another advantage personal computers offer is that as distinct from large multi-access computers they can be used at your convenience. This is your personal computer for your own exclusive use. You can store all your archives in it, look up any document on the screen at any time, and apply it to solving a variety of complicated problems which previously only big computers could cope with.

The universal use of computers has made communication with them an urgent problem. Programmers who compile routines in computer languages mediate between users and computers today. This makes the computers difficult of access to experts without any knowledge of programming. Is anything being done to make communication with computers in our own language possible?

The POET data retrieval systems, developed in the Soviet Union, are now being used with much success. Intended for storing economic and industrial information, they can be used by a data recipient without a mediator, just type out your request in Russian, and the answer will appear on the computer's screen in fifteen seconds. Such systems, with the information stored in them continuously updated, keep the user up to date with the economic and production situation and facilitate planning and control.

Do you have to know the fundamentals of programming in order to communicate with such an information retrieval system in Russian?

Not at all.

Why then should programming be taught in secondary schools? There will certainly be quite a few such systems by the beginning of the third millennium.

Communication with an overwhelming majority of the computers now in production and use calls for a knowledge of programming. This situation will continue over the next few years, and it will be up to those now at, or just out of, school to operate these computers. Furthermore, one must consider a steady rise in the output of numerically controlled machine-tools, industrial robots and various automatic production and design systems which can

be communicated with in special machine languages only. Hence the need for instruction in programming at the secondary school level. Besides, this kind of instruction does children a world of good--while learning computer programmimg they also learn rational thinking.

In the more distant future the situation may change. By the end of the century the U.S., for instance, will have an estimated 120 million visual display units intended for users without any knowledge of programming. More than a million programmers will then be needed. These programmers will have to be highly enough skilled to be able to create various systems using which will require no knowledge of programming.

Another problem which cannot be solved unless we train more programmers is software maintenance. In our country and abroad there are special centres employing large staffs of programmers and offering software maintenance services on a national scale.

Do information retrieval systems respond to oral inquires?

You can make your inquiries of such a system not only in textual form, but orally as well. The answers will also be either visual, or audio if the system in question is equipped with an audio response unit (capable of phonetical analysis and synthesis) in addition to its morphological, syntactic and sense analyzers. The first--but highly promising--steps have already been made towards the solution of the complicated problems involved in the development of such an audio response unit. Digital combinations representing words are put into the computer's memory. Upon picking up an oral instruction, the computer translates it into figures and, if their combinations coincide with those stored in its memory, does as it is told.

This is the operating principle of systems capable of understanding and printing out rather primitive texts. They are very convenient. A system like that will spare a foreman, for instance, the trouble of making out a requisition for materials in the factory office; he will simply dictate it into a microphone and it will be typed automatically in the process. I should also like to mention systems capable of converting texts into speech. They are bound to find wide application in reference services, and will prove of invaluable help to the blind.

In the early fifties many thought that computers would be able to translate, given a dramatic increase in computation speeds and storage capacity. What's the current approach to this problem?

This has turned out to be a much more difficult matter than we thought. Computer speed and storage capacity have an important role to play here, of course. But the main difficulty lies in teaching the computer to understand phrase meanings . People understand each other perfectly well even if some seemingly important words are omitted in their speech. Life experience, intonations and gestures help interlocutors fill in missing words. The brain brings semantic order and system to the enormous amounts of information it contains. Therefore, the computers' data storage system, which was good in solving

ordinary problems, proved unequal to intellectual problems such as translation. After the computers had been "taught" to extract and represent the meaning of incoming information, automatic translation became a more realistic goal. At informelectro and at All-Union Centre of Translations, computers translate pieces of scientific and technical texts at a sufficiently high level.

What about fiction?

This is something incomparably more difficult to do. Fiction abounds in figurative expressions, in words the meaning of which depends on context, in phrases expressing temporal, spatial and cause-and-effect relationships. Special logics making it possible to bring out phrase meanings have been developed for the translation of such texts. Nevertheless, the progress we have made in this field to date is not as impressive as that in the translation of scientific and technical texts.

What trends will the development of computer technology take in the near future?

The output of personal computers will grow rapidly. Medium computers performing 4-5 million operations per second and computers capable of handling very complicated problems at a speed of up to 10 billion operations per second will not be neglected either.

Do you mean the fifth-generation computers now on the drawing boards?

Fifth-generation computers will also include machines capable of such colossal performances. But this is not the main thing. These computers will feature capabilities characteristic, in particular, of the POET data retrieval systems. In order to formulate and automatically compile the program for solving a problem, such a computer will only need a description of the problem. The new-generation computers will process knowledge rather than data. Their operation will involve not only numbers but symbols as well, and their functions will be mainly to draw logical conclusions and to build up hypotheses. It is exactly this ability to draw logical conclusions, imitate human reasoning and analyze speech and texts that will distinguish the new-generation computers from their predecessors. These coming computers are sometimes referred to as "intelligent."

Today science and technology have come close to making automatic factories a reality. What kind of "intelligence" is a computer to possess to be able to manage such a complicated "unmanned" production unit?

The management and control of automatic factories will not require any higher computer intelligence than that possessed by the machines we have just discussed. However, these machines will need an extra capability. So far the sequence of operations involved in manufacturing products designed with the aid of a computer is determined by a product engineer drawing upon his work experience and knowledge. We are now busy developing special systems--"knowledge bases"--which provide a bridge of sorts between automatic product-

designing and automatic process-designing systems so that the designer can draw up flow charts himself. Such an integrated process will make for high efficiency in automated production.

Strong emphasis is now being placed on the "intelligent knowledge bases" as part of artificial intelligence, but are they really to be trusted?

One such base, the MODIS, has been developed by the Systems Research Institute. Using it, a doctor can diagnose and treat hypertension more confidently. The base contains a wealth of information taken from reference books and journals, as well as expert knowledge gained form practical experience. The base, like the other ones of its kind, operates in the interactive mode. Its specific feature is that replies to the doctor's inquiries are accompanied by explanations of the reasons for which this or that solution has been selected. This prevents the doctor from going to the extremes of either idolizing the computer or rejecting it outright. One can trust a knowledge base, but the final decision should always rest with man, not with the machine.

While we are on the subject of whether one can trust a computer, I would like to ask you the following question. The U.S. has announced its intention to build up an automated ABM system. How justified are fears that a computer error is likely to touch off a nuclear war? Won't computers become much more reliable in 10-15 years?

Such a system will comprise hundreds of satellites moving in different orbits and carrying all sorts of weapons. At American estimates, it will be able to destroy a missile within 100-300 seconds of its emergence from the atmosphere. A missile is to be detected and hit in this time span. But if a computer has erred or developed a fault, there is nothing that can block its command to start a war. Today, accidental nuclear explosion and accidental nuclear missile launches are not to be ruled out either. But I hope that should this happen heads of government will have enough time to make contact on the hot line and prevent a nuclear conflict. But if these sophisticated atuomatic systems are built, the destinies of the world will depend on robots, not on human beings. However reliable a computer is, no one can guarantee its trouble-free operation. There will always be the likelihood of a malfunction, albeit a slight one. For this and other obvious reasons such systems should not be built and deployed in outer space. Every effort must be made to stop the arms race spreading to outer space.

There already exist computers capable of playing chess, composing and performing music, drawing pictures and writing poetry. Doesn't this mean that artificial intelligence is already a fact, in a certain sense?

What these computers do is connected, to some extent, with the search for and selection of decisions. A good chess player thinks fifteen moves ahead. In a short period he considers a large number of variants (which, however, constitute only an infinitesimal fraction of the possibilities the given situation offers), discards the ones he finds useless and finally finds the optimum move. We do not know what happens in his brain in the process. Trying out one variant after another would take millions of years. Chess-

programmed computers, capable of playing on a sufficiently high level, function on the principle of discarding useless variants. International computer chess tournaments are arranged. Automatic chess instructors are on sale in some countries. Such a device performs about 30 million operations per second to make a move and "thinks" five moves ahead. Thinking 15 moves ahead is beyond the capacity of all the world's computers put together. But even if we succeed in increasing the capacity of a computer enormously, it will become none the more intelligent for all that. After all, whatever "intelligence" it possesses is built into it by an expert who has compiled a program for the solution of a certain specific problem. Man differs from the machine in that he does not merely fulfil programs stored in him memory, but creates his own programs geared to the goals set.

In a recent Paris-Match discussion of artificial intelligence, computers were predicted to bring immortality to man in the long run by imbibing an individual's life experience and knowledge and assuming his character. As a result, intelligence will exist outside that individual after his death. How would you comment on that?

It is equally the case that writing a great book or making an epoch-making discovery makes one immortal. Newton, Einsten and Omar Khayyam are immortal in this sense. Whether their intelligence is concentrated in books or in a computer makes no difference at all except that the information stored in the computer's memory can be retrieved much faster. However, information retrieval systems are merely technical facilities which help man rather than replace him. They will never acquire human intelligence. The idea of intelligence existing outside man is not altogether new. Recall, for instance, the Hegelian idea of world or divine reason and other such idealistic theories. On the other hand, the entire body of scientific evidence makes it perfectly obvious that man thinks only while he is alive. No one has succeeded in refuting that so far, and no computers, I think, are likely to change things in this respect.

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ASPECTS OF DATA DISPLAY IN ERGATIC SHIP COLLISION WARNING SYSTEMS

Kiev AVTOMATIKA in Russian, No 6, Nov-Dec 85 (manuscript received 17 Jul 85) pp 51-55

[Article by Yu. M. Shepetukha, Institute of Cybernetics imeni V. N. Glushkov, Ukrainian SSR Academy of Sciences]

[Abstract] A ship collision avoidance approach is described in which the navigator is presented with a set of possible avoidance maneuvers. The decision as to what specific maneuver to perform is made by the navigator, with allowance for requirements that are not easily describable mathematically. The approach exploits the human ability to perform effectively in unforeseen situations and to recognize patterns, as well as the hardware ability to perform fast, accurate computation. Examples of obtaining a variety of safe avoidance maneuvers are given. Figures 2, references: 6 Russian.

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COMPARATIVE ESTIMATION OF ROBOT DISTRIBUTION IN FLEXIBLE AUTOMATED PRODUCTION

Kiev AVTOMATIKA in Russian, No 5, Sep-Oct 85 (manuscript received 4 Jun 85)
pp 49-53

[Article by V. A. Bunin, Eh. G. Gudushauri and P. I. Chinayev, Institute of Machine Science, USSR Academy of Sciences]

[Abstract] The distribution of robots by tasks is analyzed in order to determine whether it is best to use a robot for each machine tool, or to use several robots to handle the same number of machines jointly. The "Hungarian method" of robot placement at work stations is investigated, and different robot deployments are compared. Tables 1, references: 1 Russian.

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COMPUTERS AID PRODUCTION AT ERFURT METAL WORKING PLANT

Moscow PRAVDA in Russian 13 Mar 86 p 4

[Article by PRAVDA correspondent, M. Podklyuchnikov, Berlin, "The World of the 1980's: Electronics Has the Floor; Experience is Common Property"]

[Text] The fine pink lines on the display formed a rectangle. Above it, the same lines sketched the outlines of a large complicated part and two parts simpler and smaller. Engineer Wolfgang Siedel confidently touched the keyboard. The large part appeared inside the rectangle. A few more touches on the keyboard and the part went into the corner. Then suddenly precisely the same thing appeared. The "twin" was turned over and fitted in the other corner. A series of small parts appeared. They occupied all of the free spaces in the rectangle. The pink lines did not make contact anywhere and a small gap remained everywhere.

"You see how the process preparation goes," explained the deputy chief of the shop, Klaus Zireno. "The program for the most economical nesting of blanks to be cut from steel sheet has now been compiled. Since electronics has started to assist us in this matter, the metal wastes have been sharply curtailed. And we are saving no small amount of time. The cutout location and spacing program is now transferred to a tape. It will be fed into the numerical program control unit for the machine tool."

Before continuing this story, I must present the plant under discussion here. This is the chief enterprise of the forging press equipment combine imeni Herbert Warnke. It is located in Erfurt. I had already had occasion to visit this plant some 15 years ago. A large construction project was underway here at that time. Friends said that it had become necessary because of the deepening cooperation within the CEMA framework. The construction was financed by credit from the International Investment Bank of the Fraternal Nations. The Erfurt plant specialized in the production of presses, needed by all of the cooperating nations. It was faced with a sharp increase in production. We now walked through the shops constructed at that time: enormous, light and equipped with powerful machine tools. It was proudly reported at the board of directors: "Since 1970, production output at the plant grew by nearly 400%. Labor productivity approximately tripled. Exports to socialist nations was increased by a factor of more than 5.5 times and it now comprises four-fifths of production."

One can be proud of such figures. Socialist economic integration has become a powerful accelerator for progress. But the rapid development has entailed a number of new problems. Wolfgang Schultz, the director of science and technology, has pondered them.

"The increased production volume, the increased complexity of communications with supplying enterprises, with customers, the rapid pace of scientific and technical progress, the problems of stepping up production, implementing maximum savings of raw materials, goods and energy - all of this has brought to life an avalanche of new requirements," he said. "Computers help us in dealing with them."

The first steps in the extensive application of computers were taken six years ago at the plant. They were successful. The Herbert Warnke enterprise has now accumulated considerable experience in this area. Other plants are also going this route, but the Erfurt plant is ahead of many of them; delegations from all corners of the GDR travel here. There is something for them to learn here.

Wolfgang Schultz, in telling how computers are used in the combine, covered their application to design and production process preparation in detail. To replace designers with electronics is of course impossible: electronics is devoid of the creative initiative that man has and is capable of putting out only that which was put into it. But the computer has already become a reliable assistant to the engineer in the plant.

Production here is not series production. Whatever the order is, it is a new press, a new design. The primary information for designers has been fed over several years into the computer memory. It now stores data on 220,000 parts; this "bank" continues to be continuously updated. 180,000 items of information on structural designs are also stored there.

The installation of the computer, the creation of the applied program package for it and the accumulation of the information in its memory are expensive. But, as Wolfgang Schultz stated, this is not an increase in expenditures, but rather a transferral of the expenditures to a shorter timeframe. However, when the time comes to do the design work, the expenditures are rapidly paid back. Let us take just one such example. A complex system of levers is used in a number of presses. The design of the system using old methods required a long time and wearisome labor. A computer does the complex calculations many times faster. And feeds the result out on the screen of a display in the form of a graphic image. If it does not suit, the computer also calculates and proposes other variants with the same speed. The computer aids here in the faster design of new equipment, making it highly competitive in the world market.

Following the design engineer, the process engineer sits down at the display. A voluminous "bank" of information on how and what has been manufactured before, which methods, machine tools and materials were used, is also stored for him in the computer memory. The same principle again comes into play:

why re-invent that which can be simply taken from ready-made, tested design solutions?

At Erfurt, the computer has become an important tool for production organization as well. We talked on this subject with the director of organization and information, Bernfried Wagner. He outlined a broad picture of how planning and the compilation of material balance sheets are handled at the plant.

The annual plan is broken down into quarters. Thus, to use Wagner's graphic expression, "forests" are created by means of which a specific "building" of the plan is erected. The following are in it: the entire financial side of the activity of the plant, the indicators for the increase in labor productivity, the assortment of manufactured products, the deadlines for the development and production of each type of product and for each order. The number of norm-hours needed for the design and production preparation is taken into account. In this case, the norms become increasingly stringent with each year and force a faster turnover and a more efficient operation. The volume of work, the deadlines for its completion, the requirements placed on quality and the growth in economic efficiency - it would be difficult to fully encompass all of this without computer hardware.

The computer makes it possible to not only promptly prepare the annual plan. It makes it possible to produce the plan in several variants. In one, the main criterion becomes, shall we say, the maximum growth in labor productivity. In another, it is the increase in production volume. In a third, it is the savings of raw materials and components. In a fourth, it is the greatest yield on capital. All of the variants are presented for the consideration of the general director of the combine. And his business is to determine which criterion is to be given preference. A mixed variant can also be requested from the computer.

It was not a simple matter to do the great amount of work involved with the introduction of electronics into all of the design, process preparation and production process control sections in the plant. The stumbling block turned out to be not the new equipment, but rather psychological inertia. The widescale use of computers, such models as the "YeS-1040" and "YeS-1055", microcomputers and production process control systems required a new way of thinking. It was simpler for the young people to master it. Centers have already been created in the nation's higher educational institutions where students are learning computer aided design and manufacturing. Young engineers arrive from the institutes knowing specifically what is involved. It is somewhat more difficult to attract experienced designers and process engineers to the computers. No small amount of explanatory work and the organization of special courses were required. And it was done in this way: programmers were assigned to individual designers. They explained the capabilities of the computer and demonstrated how it helps in the work. Gradually the inertia was overcome and the computer gained enthusiastic supporters among the engineers.

The workers also became familiar with the role of the computer: electronics has arrived even at the machine tools. Special data receivers now stand in the shops. The machining of the parts has started (and there they are often many meters in size and weigh several tons); the worker lowers a punched plastic card into the receiver slot. The shop chief can find out via the computer at any time which parts are being machined, how many norm-hours are spent on each one, which blanks have arrived and when they arrived and what and when they were forwarded for assembly.

Bernfried Wagner recalls, "We built the computer system gradually. The general director of the combine carefully followed its construction. The party organization made a considerable effort in this regard. The trade unions and youth organization had their own problems to solve in the introduction of the electronics."

But now, everyone is proud of the results. Over the last five years, the production volume has increased by 50%, without increasing the number of engineering and technical personnel or workers. Almost a third of the output products is new every year, and this is in the face of the fact that the present-day presses are the most sophisticated machines of the present generation. Up to 80% of production has already been brought up to the world state of the art. Since 1981, almost 240 patents have been obtained at the plant for new design solutions.

"But," adds Wagner, "we are only at the beginning of the road. We understand: a great deal must yet be done in order to carry out our assignments, which follow from the Comprehensive Program for Scientific and Technical Progress of CEMA Member Nations to the Year 2000."

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PRIMARY DATA TRANSDUCERS FOR SEISMIC MEASUREMENT/COMPUTING COMPLEXES (STATUS AND PROSPECTS FOR DEVELOPMENT)

Moscow IZMERENIYA KONTROL' AVTOMATIZATSIYA in Russian, No 1, Jan 85, pp 41-50

[Article by Doctor of Engineering Sciences, A. A. Abdullayev, Candidates of Engineering Sciences, E. M. Bromberg, N. I. Gorelikov and E. P. Dzisyak and Engineer, A. G. Nazarchuk]

[Abstract] The design features and technical characteristics of electrodynamic seismic sensors are investigated. It is found that practically no metrological support is available for seismic sensors. Methods are reviewed for checking the basic parameters of seismic sensors without the use of vibration benches. Technological ways of improving seismic sensors are discussed, and algorithmic methods for enhancing accuracy are described. Primary seismic transducers for telemetry systems are discussed. A list of important areas for further development is presented. Figures 8, references 17: 16 Russian, 1 Western.

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USE OF SLIDING MODES IN TECHNICAL AUTOMATION TASKS

Moscow IZMERENIYA KONTROL' AVTOMATIZATSIYA in Russian, No 1, Jan 85, pp 74-84

[Article by Doctors of Engineering Sciences, V. I. Utkin, A. S. Vostrikov, E. M. Dzhafarov, N. Ye. Kostyleva and A. Shabanovich, Candidates of Engineering Sciences, S. A. Bondarev and L. M. Spivak and Engineer, D. B. Izosimov]

[Abstract] The use of systems with sliding modes is analyzed, indicating that they can provide effective control of large nonlinear elements operating under ambiguous conditions, i.e., conditions under which traditional automation facilities cannot meet all of the requirements imposed on the control processes. The use of sliding modes in electric drives exploits their capabilities to the fullest because of the widespread use of ac motors. Electric drives for metal-working machines with sliding modes are described. Transportation facilities, in which recuperation of energy from movement by the power source often must be provided, is analyzed. The use of sliding-mode algorithms in a variety of manufacturing processes is described. Figures 2, references 31: 22 Russian, 9 Western.

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ELECTRONIC DESIGNER'S AID

Moscow TEKHNIKA I NAUKA in Russian No 1, Jan 86 p 29

[Article by A. Vaysman]

[Text] Printed circuit boards are the most important components of the majority of modern electronic devices. Their very appearance was a huge jump in the development of electronics. However, their design and manufacture is a very labor-intensive and complex process. And if the computer could be brought in to help?

The "Automated Printed Circuit Board Design System," which was created by the USSR Academy of Sciences Radio Engineering and Electronics Institute [IRE], is a great success in this direction. It is an individual workstation for the designer.

What can the "intelligent" system do? It automatically arranges the components of printed circuit boards, routing wires in them, prepares control programs for manufacturing pattern masks (an image of the printed circuit board on photographic film) and drilling holes in the boards, and prepares sketch design documentation.

The system accelerates the process six- to eightfold compared with traditional methods. This is accomplished at some sacrifice. Previously, a breadboard of the device was made on a prototype card; connections were made using jumper wires. The second possibility was to develop the diagram of the printed circuit board of the breadboard manually. One way or the other took about a month of painstaking labor. Now a computer is included in the work.

The system makes it possible to automate the most important stages in the design.

Automated design begins with the compilation of a table (file) of relationships. This table indicates the designation, type, and coordinates of the installation, the orientation of each component in the circuit, and the name of the circuits corresponding to all usable leads of the given component. With the help of a special program for arranging the components, the coordinates are specified and the forms are oriented in an operator-assigned coordinate grid. In the process the program displays the arrangement of the components together with the selected contour of the printed circuit board on

the screen of a color video monitor. The diagram of the arrangement slowly changes after each instruction to shift or turn a selected component. The program estimates the total length of the wires during the subsequent routing.

After the arrangement, the routing is accomplished automatically with a display of the process on the video monitor's screen.

The algorithm selected for the routing program provides the 95-percent separation of the wires. This is a very high index for similar systems. The remaining 5 percent is implemented with the help of a special program entitled "Graphics Editor." The results are corrected with its help.

Macroassembler is the language of the program. Its size is small, which makes it much easier to manage and increase the operating speed of the system. The compactness of the software and the use of an accessible means of graphics display make it possible to quickly lay out an analogous workstation and use such a system under the most diverse conditions.

Its main differences from the automated design systems [SAPR] that have previously been used in this area are that earlier a special automated complex with a narrowly connected system was created; now the software created by the IRE may be used on any computer with the instruction system of the "Elektronika-60".

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STATUS AND PROSPECTS FOR DEVELOPMENT OF INTERACTIVE DESIGN SYSTEMS

Moscow IZMERENIYA KONTROL' AVTOMATIZATSIYA in Russian No 2, Feb 85, pp 49-57

[Article by Candidate of Engineering Sciences, Ye. I. Artamonov]

[Abstract] A review of interactive design systems is presented. Systems employing large, medium, and small computers, microcomputers, and special-purpose computing devices are considered. Soviet hardware mentioned as being in use are the YeS-1060 or PS-2000 (with 16 processors, driven by an SM-2M), for large systems; the YeS-1020, YeS-1045, or M-4030 for medium-sized systems; the SM-3, SM-4, Nairi-4, Elektronika 100/25, SM-1800 and SM-1300 for small systems. "Presumably" El'brus and PS-3000 systems will be used in the future. The range of peripheral storage and input/output devices is described. Examples of interactive design system hardware arrangements, both in the West and the USSR, are described. Software development for interactive design systems is discussed. Recommendations for improving system efficiency are given on the basis of the analysis of the existing systems. Figures 1, references 32: 17 Russian, 15 Western.

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BRIEFS

INFORMATION SYSTEM ON SAKHALIN--Yuzhno-Sakhalinsk-- An automated reference information system -- the first on Sakhalin -- was introduced by specialists of the All-Union Production Association, Sakhalinmorneftegazprom. It is based on YeS-1022 and YeS-1045 computers. The system will aid specialists effectively to obtain necessary information on the progress of drilling work and petroleum output. ["A Computer Will Provide Prompting"] [Text] [Moscow SOVETSKAYA ROSSIYA 23 Jan 86 p 1] 9645

MINIATURE CALCULATORS--The miniature computers that our domestic industry is putting out will save the pupil, the student, and the engineer from dreary calculations and will help save time -- only fractions of a second are needed to accomplish the most complicated mathematical operations! The "Elektronika MK-51," intended for scientific calculations, automatically accomplishes logarithmic operations, the calculation of natural and decimal logarithms, antilogrithms, and direct and inverse trigonometric functions. It accomplishes operations with memory, statistical calculations, and the correction of erroneously entered numbers. Price -- 70 rubles. The "Elektronika MK-53" is the first Soviet microcalculator combined with an electronic calendar, stop watch, and alarm. The expanded service capabilities and small weight (50 g in all) make it convenient for every-day. Price -- 70 rubles. The "Elektronika MK-60" is powered by a solar element battery. It automatically accomplishes the four arithmetical operations, the change of a numerical sign, the extraction of quadratic roots, the calculation of percentages, operations with memory, and the correction of erroneously entered numbers. ["The Microcalculator is Our Helper"] [Text] [Tbilisi ZARYA VOSTOKA 15 Jan 86 p 4] 9645

SYSTEMS FOR AGRO-INDUSTRIAL COMPLEXES--Moscow--I think that it is necessary to accelerate the creation of a unified system of computer information services for all enterprises and branches of agro-industrial complexes and broad introduction of automation and economic and mathematical methods of management. At the same time, in its development and improvement, an automated management/control system (ASU) should undergo serious qualitative changes under the influence of two most significant factors -- the introduction of "non-paper" information technology and the integration of automated systems. Such an approach to the matter will undoubtedly facilitate, above all, a closer cooperation among all units of agro-industrial complexes in the planning and in the provision of supplies and equipment to production and the elimination of parallelism and duplication in the utilization of information. The possibility will emerge for more rational location and specialization of production and for increasing the labor productivity of workers engaged both directly in production and in management. And what is most important, of course, is to obtain steady

growth in the production of food products while lowering their cost and to reduce losses in the transportation, storage, and processing of agricultural raw materials. In this connection, I propose to note the following in the sixth section of the Draft Basic Directions: "To implement measures for accelerated introduction into broad practice of a unified system of computer information services for all units of agro-industrial complexes and to strive persistently for a high degree of effectiveness in the functioning of automated management/control systems for agro-industrial complexes. [By I. Shibayeva, economist and mathematician] [Text] [Moscow SELSKAYA ZHIZN 17 Jan 86 p 2] 9645

ASU'S FOR URENGOY OIL-GAS FIELD--Sumgait, 22 January (Azerinform)--Automated management/control systems developed by the collective of the Scientific Research and Design Institute for Complex Automation in the Petroleum and Chemical Industries will permit more effective development of the petroleum and gas riches of the North. In accordance with the all-union special purpose complex scientific and technical program, two systems from the institute were introduced at Urengoy. One of them represents a complex that at the site controls and directs not only well-operation regimes but also related installations such as compressors, stations, headers, and others. This provides the possibility for clear and efficient introduction of changes in the work of all services, depending on the status of the technology and the presence of reserves. The second development, introduced at the association, Urangoygazdogycha, is a system of very great importance. Up-to-date computer technology permits the system to solve over a hundred problems in management, planning, control, and accounting. The use of these systems will bring Northerners additional revenue of about three million rubles. [Text] [Baku BAKINSKIY RABOCHIY 23 Jan 86 p 2] 9645

COOPERATIVE EFFORTS INVOLVE SVETLANA PLANT--Specialists from the Leningrad Association, Svetlana, have suggested the development of models of every-day electronic technology to partners in inter-industry cooperation. As LenTASS reports, the miniature computer created here has found application in the Vilma magnetic tape-recorder developed by producers in the Lithuanian capital. The electronic device with which it has been equipped permits the programming of the work of a musical complex. The item was developed by the joint efforts of partners in inter-industry cooperation and is distinguished by improved operating characteristics and a better sound quality. In introducing microelectronics of a new generation, the Svetlana people are thinking, above all, about the effect that it will provide to cooperating enterprises in the future. With this aim, the Leningraders are providing instruments with universal "talents" that will permit a sharp increase in the functional capabilities of machines. Svetlana specialists have been able, in very short times, to provide computer hardware to irrigation installations, water pumping stations, and power supply installations, and they have introduced microcomputers in many other industries. This has permitted the transfer of various technological processes to unmanned technology and the improvement of product quality. ["Using Electronics"] [Text] [Leningrad LENINGRADSKAYA PRAVDA 15 Jan 86 p 1]

UNIVERSAL COMPLEX--A large economic effect is expected from the telemechanical complex created according to design developments by associates of the Sumgait NIPINEFTEKHIMAVTOMAT (Scientific Research and Design Institute for Complex Automation in the Petroleum and Chemical Industries). The photo shows (left to right) Brigadier Nikolay Golikov and associates of NIPINEFTEKHIMAVTOMAT, designer Artem Mnatsakanov and engineer Vidadi Kuliyev, adjusting the complex. [Text] [Moscow NTR: PROBLEMY I RESHENIYA No 12, Dec 85 p 2] 9645

ASU'S AT POWER STATIONS--Uzbek SSR--Substantial additional profit will be brought by automated control systems for thermal and nuclear power stations; the output of these systems has been assimilated by the association, Sredazelektroapparat. The economic effect from the use of this equipment in the national economy exceeds 7 million rubles. Competition is expanding within the association in honor of the 27th CPSU Congress. The photo shows A. Kalusovskiy, an engineer from the design bureau of the association, at the processing of a program for automatic feed units for fuel supply bunkers at thermal electric power stations. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 45, Nov 85 p 6.

TRAINING AIDS--The Novosibirsk scientific and technical community has created a consultative center with a club for users of microprocessor technology. In the city, at the Electronic Instrument Technicum, a terminal class (for 20 persons) has been organized for those who have decided to master the new specialty, "Maintenance of Computers and Peripheral Equipment." Here there are monthly courses (with leave granted from production) for engineers whose work is related to the utilization of microcomputer and microprocessor technology (150-200 persons). ["For Computer Literacy Among Engineering and Technical Workers"] [Text] [Moscow TEKHNIKA I NAUKA No 12, Dec 85] [COPYRIGHT: "Tekhnika i nauka", 1985] The preparation of specialists for robot technology in educational institutions and plants will be aided by a robot simulator created at the Frunze Polytechnical Institute. The innovation is highly evaluated by specialists and has won a bronze medal from the Exhibition of the Achievements of the USSR Economy (Moscow). The electronic teacher not only teaches how to work with manipulator robots, but also "explains" the programming control system and points out errors. The new "thinking" mechanism differs from all presently known domestic models in its simplicity and universality. It consists of two "hands" and an electronic "brain" that controls them. A special device with an indicating light provides the possibility for trainees to see how the process of "thinking" is proceeding in the electronic brain. [Text] [Frunze SOVETSKAYA KIRGIZIYA 27 Dec 85 p 3] Petrozavodsk--An unusual electronic calculator has taken its place among teaching aids in a class at the 36th Secondary School in Petrozavodsk. Its design fully duplicates usual pocket calculators, but differs from them in having huge dimensions. Attached next to a blackboard, this instrument can be seen from any desk. This computer was made by sponsoring associates of the computer center of the production association, Petrozavodskbummash. In the near future, they intend to equip all of the city's schools with such wall calculators. ["Calculator on the Wall"] [Text] [Moscow TRUD 18 Feb 86 p 2] 9645

CONTROL FOR PHOSPHORUS PRODUCTION--In the Dzhambul production association, Khimprom, an experimental production operation is being conducted with an automatic system for optimal control of technological processes for electrosublimation of yellow phosphorus in an ore-smelting furnace. This system was based on microprocessors. The technology of phosphorus sublimation is complicated by frequently arising critical situations which are at times difficult for a human to analyze and to make an optimal decision. However, all of these, at first glance, "emergencies," take place according to definite patterns. In other words, if a computer can be programmed with a system of algorithms corresponding to these patterns, it is possible to replace the human. As the result of introducing microprocessor and digital technology, the production of yellow phosphorus has increased by 1.5 percent and current expenditures have been reduced by more than 1 percent. Calculations show that, with these relatively small percentages, the yearly savings are worth 150,000 rubles. [By E. Nurshin,

head of the section for scientific and technical propaganda of the Kazakh Scientific Research Institute for Scientific and Technical Information and for Technical Economic Research attached to Kazakh SSR Gosplan] [Text] [Alma-Ata KAZAKHSTANSKAYA PRAVDA 12 Jan 86 p 2] 9645

INFORMATION SCIENCE DICTIONARY--The publishing house, Ayastan, has put out a "Russian-Armenian Dictionary of Information Science Terminology," compiled by a collective of authors. The publication covers 2235 terms and combinations of terms taken from that branch of science that deals with the study of the mechanisms for the creation, collection, processing, storage, search, distribution, and utilization of documentary information. The dictionary is a combined explanatory and translation type: along with an explanation of a Russian term or combination of terms there is a translation into Armenian. As an appendix at the end of the dictionary, there is an alphabetized index of Armenian information-science terms with references to Russian equivalents, making it also possible to translate from Armenian to Russian. The publication is intended for workers in scientific and technical information, translators, and students in secondary and specialized educational institutions. [By A. Galstyan] [Text] [Yerevan KOMMUNIST 15 Jan 86 p 2] 9645

INTER-CITY TELEPHONE SYSTEM--In Frunze, the installation of an automatic inter-city telephone station with a Kvarts program control has been completed. It was made at the Riga State Electrotechnical Plant imeni V. I. Lenin. Frunze became the second city, after Vilnius, where such a station has been installed. It was the second experimental model, the first having been tested last year in Vilnius. Kvarts has many advantages in comparison with presently operating equipment. The innovation is distinguished by reliability, quality, and speed of communication, which are provided by a specialized computer. Among the additional qualities of Kvarts is the following: being tied by code to another city, the subscriber does not have to dial his number. The station will go into operation in 1987 (the construction process will take all of next year). The change of equipment to a republic inter-city telephone station is taking place according to the plan for the technical re-equipping of the industry and in accord with the draft Basic Directions for the Economic and Social Development of the Country. In the 12th Five-Year Plan, the level of communications automation for republic inter-city telephone stations by introducing new technology will be brought to 90 percent. [Text] [Frunze SOVETSKAYA KIRGIZIYA 27 Dec 85 p 3] 9645

ACADEMY SYSTEM COMPUTER NETWORK--Khabarovsk call letters appeared on the screen of a display at the Institute of Electronics and Computer Technology of the LaSSR Academy of Sciences. They announced the beginning of a permanent link between the computers of scientific institutions of very distant regions -- the Baltic and the Far East. The experimental network of the USSR Academy of Sciences and the union-republic academies of sciences that has been put into operation comprises dozens of computers, located in various parts of the country -- from Leningrad to Tashkent and from the western boundaries to the shores of the Pacific. Henceforth, these machines, which have become subscribers of a unified system, can be united by telephone lines, can conduct dialog, and can exchange information. "The interconnection of the computers of academy institutes is an important event in the scientific life of the country," said E. A. Yakubaytis, academician of the LaSSR Academy of Sciences, chief designer of the Akademset', and chairman of the Commission for Collective-Use Computer Centers and Computer Networks of the USSR

Academy of Sciences. "An open network, having no analogs, has been created. Its uniqueness is that computers of various types and with various programs, formulated in various machine languages 'understand' one another. Special network programs and devices serve as intermediaries between them. All of this offers broad capabilities to scientists. At their command, any computer is now capable of automatically requesting scientific information from machines dispersed over the vast territory of the USSR. And the national data transmission center in Moscow also permits addressing foreign information banks in Europe, Asia, and America." During the 12th Five-Year Plan, the Academy Network will be fully developed, will be put into an operational mode, and will receive further development. It is foreseen that experience with this will be widely used to construct information networks in branches of the national economy. [LATINFORM] [Text] [Riga SOVETSKAYA LATVIYA 24 Jan 86 p 2] 9645

IMPROVED SM-1600 COMPUTER COMPLEX--Vilnius--The output of an improved SM-1600 computing complex has been assimilated at the Vilnius Computer Plant imeni V. I. Lenin. Serial production has begun here for four new variants of this machine with expanded functional capabilities. With this, the enterprise collective has reached a basic point in increased socialist obligations adopted in honor of the CPSU 27th Congress. In distinction from its antecedant, this complex, provided with expanded memory, can be applied in automated control systems at enterprises and agencies and can transmit information by telephone links. ["A New Computer"] [Text] [Baku BAKINSKIY RABOCHIY 21 Feb 86 p 2] 9645

TELEVISION DATA LINK--Penza--The Penza Center for Scientific and Technical Information and Propaganda has introduced a television channel link with the All-Union Scientific and Technical Information Center. Owing to this link, scientific research institutes, design bureaus, and industrial enterprises have greater access to data banks collected all over the country. It has simplified and accelerated the retrospective search for reports of scientific research and experimental design works and candidates' and doctors' dissertations. Information can be obtained on a display or on a printing device. Work is also being conducted on a "Copy Order" mode. The TAP-34 intelligent terminal is a fourth-generation computer. It is simple and reliable in operation. [By V. Lifanov, independent correspondent] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA 25 Jan 86 p 2] 9645

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BRIEFS

ASU FOR RIVER BASIN--Specialists of Central Asia have developed a mathematical model of the first in the country inter-Republican automatic control system for the water reserves in the Syrdarya basin. The ASU will help to save over 140 million cu.m. of water yearly. The organization of water distribution of a large river with the aid of electronics and telemechanics is provided for in the long-term land improvement program. There is a great need for the system considering that over 40 percent of all Soviet cotton is produced in the Syrdarya basin. The river's water is used in Uzbekistan, Kazakhstan, Kirghizia and Tajikistan. However, this water is not sufficient for the further development of irrigated farming in the region. The only way out is rational use of that which is available. Some 200 water distributing facilities--dams, water reservoirs, pumping station and water regulation installations for the canals along the river's entire length will be controlled by automation. The building of the first part of the ASU will be completed in 1988. ["An Automatic Control System for a River for the First Time."] [Text] [Moscow MOSCOW NEWS No 4, 2-9 Feb 86 p 9]

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BRIEFS

GEOPHYSICAL PROSPECTING--A map plotted by a computer helped geologists detect a new deposit of minerals. This computer-assisted method of prospecting was devised by scientific workers of the Department of Geology in the Soviet Republic of Georgia (transcaucasian region). The computer put together and summed up age-old experience of individual prospectors and modern geological and geophysical data. Now when the computer is informed of a possible location of ore-containing zones it rather rapidly charts most promising areas of search. At present the Department of Geology plans to establish the country's first regional geological forecasting center. ["Computer Helps in Prospecting Materials"] [Text] [Moscow TASS 18 Mar 86]

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